Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 1529-1541 | ISSN:2251-6727

Anti-diabetic Activity of Ethanolic Extract of Rosa Centifolia and Its Purified Fractions

Khushbu Singh*[1], Vikas Kumar[1], Amita Varma[1], Pushpa Prasad Gupta[2], Shilpa Sahu[3], Pooja Gadkari[4], Lalita Sandey[5]

[1]Department of Pharmaceutical Sciences, Sam Higginbottom University of Agriculture, Technology and Sciences, Naini, Prayagraj – 211007, Uttar Pradesh, India

[2]Chhatrapati Shivaji Institute of Pharmacy, Durg – 491001, Chhattisgarh, India

[3]Columbia Institute of Pharmacy, Tekari – 493111, Raipur, Chhattisgarh, India

[4]Shri Shankaracharya College of Pharmaceutical Sciences, Junwani – 490020, Bhilai, Chhattisgarh, India

[5]Banasthali Vidyapeeth Jaipur – 302001, Rajasthan, India

***Corresponding author email –** khushbu0904singh@gmail.com

(**Received**: 14 April 2024 **Revised**: 01 May 2024 **Accepted**: 18 June 2024)

KEYWORDS

Rosa centifolia; In-vivo study; Toxicity study; Anti-diabetic activity; Histopathology study

ABSTRACT:

People all over the world have long consumed Rosa centifolia L. as a wild edible herb. The Aim of This study is to explore the antidiabetic activity of ethanolic extract and its fraction of Rosa centifolia L. petals. Four fractions of ethanolic extract (mother extract) were isolated (ME, F6, F6.4, F6.4.2) and were found phytochemical-rich. All four fractions were administered orally which effectively inhibited the elevation of plasma glucose in rats loaded with glucose, and its ethanolic fraction (F6.4.2) exerted significant inhibitory actions in STZ-induced diabetic rats.

Background: Rosa centifolia L. is a native plant of India. The rose petals are used in the food industry to alter the flavor of foodstuffs.

Objectives: The aim of this study to investigate the antidiabetic potentials of flavonoid rich ethanolic extracts of Rosa centifolia petal in type 2 diabetic Wistar albino rats.

Material and methods: Fifty four rats were randomly distributed into nine groups of six animals each with group 1 serving as the normal control. Groups 2 to 7 were given 0.5% CMC in their drinking water for 14 days, after which 60 mg/kg of streptozotocin was administered. Group 2 animals served as the diabetic control, while groups 3, 4, and 5 were treated with, 100 mg/kg plant extract, 250 mg/kg plant extract, and 500 mg/kg plant extract respectively. Groups 6, 7, and 8, were treated with an ethanolic fraction of plant extract 100 mg/kg, 250 mg/kg, and 500 mg/kg glibenclamide respectively. Biochemical parameters such as liver and kidney function tests, lipid profile, as well as lipid peroxidation, and antioxidant enzymes were assessed in addition to histopathology.

Results: It was observed that daily oral administration of MSD and FSD for 14 days significantly ($p < 0.05$) improved the observed pathological changes as a result of type 2 diabetes.

Conclusion: It could be inferred from results obtained in this study that methanolic and flavonoid-rich leaf extracts of Rosa centifolia have antidiabetic potential in type 2 diabetic rats.

1. Introduction

Diabetes mellitus (DM) is a metabolic disorder of multiple reasons characterized by chronic hyperglycemia with disturbances of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, insulin action, or both. Long-term damage, dysfunction, and failure of various organs are the effect of diabetes mellitus [1]. The progression of diabetes has been increasing globally from 108 million (1980) to 463 million (2019) with 1.6 million deaths in 2016 attributed to them worldwide, estimated to rise to 578 million (10.2%) by 2030 and 700 million by 2045 [2]. According to the WHO, about 80% of the population uses herbal medicines to treat numerous diseases and is acquiring growing attention in universal healthcare debates [3, 4]. Two systems of diabetes (Types 1 and 2) vary in their pathogenesis, but both have hyperglycemia as a common trademark. In type 2 diabetes impairment in insulin secretion combined with or without impairment of insulin action caused hyperglycemia [5]. The World

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 1529-1541 | ISSN:2251-6727

Health Organization testified that the worldwide global population is at the core of a diabetes epidemic. The people in Southeast Asia and Western Pacific are at bigger risk, and the mainstream of patients have type 2 diabetes. Insulin resistance characteristically precedes the onset of type 2 diabetes and is frequently accompanied by other cardiovascular risk factors such as dyslipidemia, hypertension, and prothrombotic factors [6]. Currently, available medicine for diabetes is expensive and has serious adverse effects. Similarly, DM patients who suffered from renal, hepatic, and cardiac failure are commonly prescribed antidiabetic agents that are contraindicated. Therefore, the use of plant-derived and bioactive compounds appears to be an improved alternative for the treatment of DM their use is safe, effective, and low-cost. Indeed, the World Health Organization (WHO) has recommended traditional medicinal plant-based treatments for patients suffering from DM [7]. Therefore, the search for the discovery of antioxidant and antidiabetic agents from plant sources is an important approach essential to battle the prevalent nature of this condition [8]. Plants are used as both food and medicine simultaneously. The prospect of using the plant as a medicine is huge due to the inclusive diversity of plants around the world. Cultural and geographical factors also simplified the treatment of various diseases with diverse formulations of plants like crude extracts, whole plants, a paste of plants, infusions, etc [9]. Plants are recognized to be rich in natural antioxidants such as carotenoids, tocopherols, flavonoids, vitamin C, and numerous other phenolic compounds. Traditionally more than 800 medicinal plants are used for treating diabetes owing to their potency, lesser side effects, and low cost [10]. Up to the existing day, roses are one of the most important groups of ornamental plants, a sign of encouragement, transparency, love, happiness, and gorgeousness, called the “Gift of angles”, “Queen of flowers”, and “Gol-E-Mohammadi” At present, nearly 1000 genotypes of roses are known but only a few of them exhibit the marked fragrance which is chosen by perfumers [11]. Rosa damascena Mill. Form a trigintipetal a Dieck, Rosa alba L. Rosa damascena Mill. var. alba, Rosa gallica L. Rosa centifolia L., Rosa chinensis, and Rosa rugosa are grown globally predominantly and used as raw materials for the perfume and cosmetics industry [12–13]. For the production of rose oil two main species of rose are cultivated: Firstly, *Rosa Damascene Mill* which is broadly grown in Bulgaria (70–80%), India, Turkey, Russia, and China. Secondly, *Rosa centifolia Linn.* (*Rosa indica)* is more commonly grown in Morocco, Egypt, and France [14, 16]. Cabbage rose is a common name for *Rosa centifolia* L. belonging to the family Rosaceae, a perennial plant commonly known as hundred-leaved rose or shatapatri, which exists throughout India. The plant is shrubby and is 6.15cm to 3 meters in height. Branches bear thorns. Leaves have serrate margins. Flowers have many shades of color. Fruit – is oval and converts red on ripening [17]. Rosa centifolia is an intricate hybrid that is a breed of *Rosa gallica* L., *Rosa moschata* Herm., *Rosa canina* L., and *Rosa damascene* Mill [18]. According to another source, *Rosa centifolia* grows like a plant, shrub, bush, or thicket. This plant is of Asiatic origin, and the countries where it is extensively cultivated for extractive purposes include Bulgaria, Turkey, Morocco, France, and Italy. The plant parts used are the flowers, buds, leaves, and fruit (hips) [19, 20].

For induction of experimental diabetes mellitus streptozotocin (STZ) is a valued agent. In this model, STZ can stimulate the generation of free radicals, which may be one of the most crucial causes of β-cell damage and its diabetogenic effect. The present study has the following objectives: (i) to investigate the presence of phenolic and flavonoids phytochemical in the ethanolic extract of *R. Centifolia L.* petal by UV-VIS spectroscopy, (ii) to evaluate *in-vivo* antidiabetic activity of ethanolic extract of *Rosa centifolia L.* petal and its fractions by STZ-induced diabetic rats model [21].

2. Material and methods

2.1. Chemicals and reagents

All the chemicals Pandit Ravishankar Shukla University, Raipur (Chhattisgarh). Quercetin Glibenclamide and streptozotocin Sigma-Aldrich (St-Louis, MO, USA) were issued from the Columbia Institute of Pharmacy, Raipur, Chhattisgarh, India. All other reagents used were of analytical grade.

2.2. Plant material, Extraction, and fraction

Rosa centifolia flowers were freshly obtained from the botanical garden Koni Bilaspur C.G. The samples were packed promptly in polyethylene bags to avoid decomposition of some bioactive compounds Botanical identification was performed by Professor A. K. Dixit, Department of Botany. The plant part (rose petal) has been retained at the department herbarium for future

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 1529-1541 | ISSN:2251-6727

reference. The minute pieces of fresh flower petal samples (200 gm) were extracted by distillation method using a Clevenger apparatus for 4 hours. After the complete extraction of rose petals, the sample was filtered and the solvent was evaporated using a rotary evaporator under pressure for 30 min resulting in a semisolid crude extract (5.17 g). A small quantity (0.37 g) of ethanolic crude extract from the plant was transferred to a test tube for another study [22, 23]. The crude extract of *Rosa centifolia* was subjected to column chromatography to separate the extract into its component fractions and eluted with petroleum ether: chloroform (100:0 to 0:100 with constant polarity increase of 10%) successively to afford ten fractions (fractions F1 to F10), and then purified by recrystallization. At last, fractions F5 and F6 were obtained from the first step of the fractionation process. F6 Eluted successfully with chloroform: ethyl acetate (100:0 and 0:100) yielded fractions denoted F6.1 to F6.10 fraction F6.4 purified and eluted with ethyl acetate: ethanol (100:0 and 0:100, 500 ml each fraction). Fraction F6.4 afforded ten sub-fractions (F6.4.1 to F6.4.10) of which F6.4.2 (107 mg) was isolated, stored in brown glass bottles, and become ready for investigation [24–26].

2.3. In-vivo study for extract and its fraction

The antidiabetic activity for the ethanolic extract of *Rosa centifolia* petals and its final fraction was confirmed by a study conducted on the animal. We selected Albino Wistar rats for evaluation in the STZ-induced diabetic rats model.

2.4. Preparation of test samples

The dried final fraction of ethanolic extract (Plant extract at first dose level 250mg/kg, and at second dose level 500 mg/kg b.w. [b.w. body weight]), fractions (Plant active fraction at first dose level 250 mg/kg, and at second dose level 500 mg/kg b.w.) and the reference drug Glibenclamide (10mg/kg b.w.) were suspended in 0.5% carboxymethylcellulose (CMC) prepared in distilled water prior to oral administration to experimental animals (10 ml/kg b.w.).Only CMC suspension was administered to the control group animals [27–29].

2.5. Animal

Albino Wistar rats weighing 120-150 g of the male sex were selected for the study. They were fed with a standard rat pellet and water from Reverse Osmosis Purifier (Kent). Research on animals was conducted in harmony with the guidelines of the Committee for Control and Supervision of Experiments on Animals (CPCSEA) as the institute has CPCSEA registration (Reg. number: 1321/ PO/ ReBi/ S/10/ CPCSEA/22-10-2014). The experimental protocol was approved by the Institutional Animal Ethics Committee of the Regional Research Institute of Columbia Institute of Pharmacy, Raipur, Chhattisgarh, India.

2.6. Acute Oral Toxicity Study of the Crude Extracts of *Rosa centifolia*.

An acute oral toxicity study for the extracts of *Rosa centifolia* was performed. The Wistar rats were starved overnight, being provided only water before oral dosing rates are divided into nine groups and six animals in each group (n=6) [30]. Then ethanolic extract and active fraction were administered orally at different dose levels, that is, 100, 200, 500, 1000, 1500, and 2000 mg/kg of body weight. The rats were kept under observation continuously at short intervals of time for 3 h after administration and then for the next 48 h. for gross behavioral, neurological, and any adverse change thereafter for any lethality or death [31,32].

2.7. Experimental Design

All the animals were randomly divided into eight groups with six animals in each, serving as normal (nondiabetic), diabetic control, and diabetic treated with extracts of rose centifolia petals. and active fraction of extract [33]. Diabetic reference control: glibenclamide and vehicle (CMC 0.5%). Glibenclamide was given at a dose of 10mg/kg of body weight. Diabetes was induced in all groups except the normal control group. All treatments were given orally after the 4th day of STZ administration (except normal control). The oral administration of crude extracts (extracts with different concentrations) was continued once daily at the same time for 14 days. Bodyweight and blood glucose levels were estimated on the 0th, 7th, and 14th, day of treatment [34, 35].

Group I: Normal nondiabetic control (0.5 % CMC solution)

Group II: Diabetic control (0.5 % CMC solution)

Group III: Diabetic rats Plant extract at first dose level (100 mg/kg body weight/d)

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 1529-1541 | ISSN:2251-6727

Group IV: Diabetic rats Plant extract at second dose level (250 mg/kg body weight/d)

Group V: Diabetic rats Plant extract at third dose level (500 mg/kg body weight/d).

Group VI: Diabetic rats Plant active fraction at first dose level (100 mg/kg body weight/d).

Group VII: Diabetic rats Plant active fraction at second dose level (250 mg/kg body weight/d).

Group VIII: Diabetic rats Plant active fraction at third dose level (500 mg/kg body weight/d).

Group IX: Diabetic rats (10 mg/kg Glibenclamide body weight/d).

2.8. Induction of Diabetes

Diabetes was induced in albinoWistar rats by a single intraperitoneal (i.p.) injection of60mg/kg of streptozotocin (STZ), reconstituted in freshlyprepared normal saline (0.9% W/V) after overnight fasting.After STZ administration at a dose of 60 *mg/kg* b.w., 48 *hr*later blood samples were collected and glucose levels weremeasured in rats. Those rats with fasting serum glucose levels more than240mg/dL who were considered diabetic (hyperglycemic) were selected for furtherstudy [36, 37].

2.9. Assessment of Effects of Extracts on Biochemical Parameters

Oral administration with plant extracts was started 72 h after streptozotocin injection in diabetic rats while the normal group and diabetic control group were administered only with vehicle [38]. The rats were sacrificed after 14 days after anesthetizing them using halothane and blood was collected on the termination day from the dorsal vena cava by opening the abdomen. The serum was collected and analyzed for glucose, cholesterol, triglycerides, LDL, SGOT, SGPT, ALP, creatinine, and total protein estimation using AutomaticBiochemistry Analyser (Erba; XL-640) [39].

2.10. Effect of Extracts on Body Weight, Feed Consumption, and Water Consumption

The effect of the ethanolic extracts and active fraction on parameters like body weight, feed consumption, and water consumption were determined and recorded during the study period [40].

2.11. Histopathological study

Animals' liver, pancreas, and kidney tissues were used for histopathological study. Tissues were fixed in 10% buffered formalin, routinely processed, and embedded in paraffin wax. Sections were cut on glass slides at a thickness of 4 mm and stained with hematoxylin and eosin (H&E) (Culling, 1974). The slides were examined under a light microscope and the magnified images of the tissue structures were captured [41].

2.12. Oral Glucose Tolerance Test

The oral glucose tolerance test was performed in overnight fasted normal rats. Healthy rats were randomly selected and distributed into eight groups (n = 6). One group (normal) was administered R.O. water and five groups were given orally ethanolic extracts of *Rosa centifolia* and active fraction at a dose level (250mg/kg body. weight,500 mg/kg body weight, 250 mg/kg body weight/d, and, 500 mg/kg body weight/d, respectively) and the eighth group was given glibenclamide (10mg/kg). Glucose (2 g/kg) was fed for 1 h after the administration of R.O.water, extracts, and glibenclamide [42,43]. Blood was collected from the punctured heart under halothane inhalation at definite intervals of 0, 30,60, 90, and 120 minutes (min) of glucose administration, and glucose levels were estimated [44].

2.13. Statistical Analysis

All the values of body weight, fasting serum glucose, and biochemical estimations were expressed as mean ± SEM, and ANOV was carried out followed by student t-test by using GraphPad Prism (8.01) (Microsoft Corporation, USA). statistical software. Differences between groups were considered significant at $P< 0.05$ levels.

3. Results

3.1 Acute Oral Toxicity Testing

These acute toxicity studies discovered the nontoxic nature of *Rosa centifolia*. The extracts were found to be safe up to the dose level of 2000 mg/kg of body weight in rats. There was no lethality or any toxic reactions found in animals. by oral administration of extracts and a fraction of the extract of *Rosa centifolia* until the end of the study period.

3.2 Antihyperglycaemic Effect of Rosa centifolia

The effect of ethanolic extracts, an active fraction of *Rosa centifolia*, and glibenclamide on blood glucose

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 1529-1541 | ISSN:2251-6727

levels in normal, diabetic, and extract-treated rats is presented in Table 2 (a). The highest percent variation in fasting glucose levels was shown by plant active fraction at the third dose level (54.07%), followed by ethanolic extract (43.93%). The standard reference drug glibenclamide (10 mg/kg b. w) was found to decrease fasting glucose levels by 48.09% after 21 days of treatment. The other fraction of extract at a different dose level, that is, Diabetic rats Plant extract at first dose level (100 mg/kg body weight/d), Diabetic rats Plant extract at second dose level (250 mg/kg body weight/d), Plant extract at third dose level (500 mg/kg body weight/d), Plant active fraction at first dose level (100 mg/kg body weight/d) also showed inhibitory effect on glucose levels. The highly bioactive fractions were tested for dose dependence and were observed to show increased antihyperglycemic activity with an increase in dose as shown in table 2 (b).

Table 1: (a) Effect of extracts of Rosa centifolia and glibenclamide on fasting blood glucose levels of rats. (b) Dose-dependent effect of ethanolic extract and a fraction of ethanolic extracts of Rosa centifolia and glibenclamide on fasting blood glucose levels of rats.

Table - a

Group	Serum glucose mg/dL		
	0th day	7th day	14th day
Normal	82.4±0-109	85.5±0-015	82.86±0.224
Diabetic control	350.9±0.612	368.3±3.880	399±0.684
Diabetic + Plant extract (500 mg/kg)	387.0±2.560	357.7±1.640	202±0.275
Diabetic + Plant ethanolic fraction (500 mg/kg)	373.2±1.566	242.8±0.170	177.6±1.141
Diabetic + Standard drug (10mg/kg Glibenclamide)	355±0.553	281.3±0.745	188.3±0.462

Table - b

Group	Serum glucose mg/dL		
	0th day	7th day	14th day
Normal	84.73±0.183	84.08±0.112	83.22±0.079
Diabetic control	365.0±0.224	379.8±0.504	419.3±0.038
Plant extract at first dose level (100 mg/kg)	354±0.132	331±0.644	288±0.260
Plant extract at second dose level (250 mg/kg)	371.9±0.687	327.5±0.758	288.3±1.073
Plant extract at third dose level (500 mg/kg)	364.5±0.664	278.5±0.051	237.8±0.472
Plant ethanolic fraction at first dose level (100 mg/kg)	358.3±0.319	341.6±0.525	318.7±0.486
Plant ethanolic fraction at second dose level (250 mg/kg)	375.2±0.525	230.1±0.271	201.4±0.130
Plant ethanolic fraction at third dose level (500 mg/kg)	365.0±0.414	229±0.635	162.4±0.408
Standard drug (10 mg/kg Glibenclamide)	373.0±0.115	258.9±0.215	194.0±0.688

3.3 Effect of Extracts of Rosa centifolia and Glibenclamide on Various Biochemical Parameters in Rats

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 1529-1541 | ISSN:2251-6727

The extracts of *Rosa centifolia* ethanolic extract (500 mg/kg b. w) and a fraction of extract (500 mg/kg b. w) significantly lowered the levels of cholesterol, triglycerides, LDL, total protein and creatinine in diabetic rats when compared with the diabetic control group (Table 3). Total protein was found to be significantly dropped in the diabetic control group, while it was found to be elevated in the extract and glibenclamide-treated diabetic rats. The extracts were also shown to markedly lower the liver marker enzymatic activity (SGPT, SGOT, and ALP) in diabetic rats as represented in Table 4.

Table 2: Effect of extracts of Rosa centifolia and Glibenclamide on various biochemical parameters in rats.

Group	Cholesterol	Triglyceride	LDL	Total protein	Creatinine
	14th day				
Normal	68.98±0.203	73.58±0.161	83.20±0.115	7.10±0.011	0.683±0.003
Diabetic control	63.31±0.141	92.72±0.089	182.0±0.040	4.20±0.010	1.92±0.416
Plant extract at third dose level (500 mg/kg)	64.81±0.011	84.60±0.095	120.8±0.152	6.70±0.017	0.946±0.014
Plant ethanolic fraction at third dose level (500 mg/kg)	71.14±0.144	75.76±0.205	99.11±0.240	6.03±0.037	0.866±0.006
Standard drug (10 mg/kg Glibenclamide)	65.69±0.09	77.97±0.030	90.41±0.052	7.05±0.034	0.73±0.005

Table 3: Effect of extracts of *Rosa centifolia* and glibenclamide on liver marker enzymes of streptozotocin-induced diabetic rats.

Group	SGPT	SGOT	ALP
Normal	95.33±0.026	114.8±0.113	175.3±0.162
Diabetic control	209.8±0.320	244.7±0.157	296.2±0.010
Plant extract at third dose level (500 mg/kg)	120±0.168	132.6±0.08	222.1±0.416
Plant ethanolic fraction at third dose level (500 mg/kg)	112.0±0.21	121.7±0.037	201.5±0.083
Standard drug (10 mg/kg Glibenclamide)	102.6±0.330	119.2±0.245	198.7±0.147

3.4 Effect of Extracts of Rosa centifolia and Glibenclamide on Feed Consumption and Water Consumption in Rats.

The ethanolic extract treated rats (at a dose level of 500 mg/kg b. w) final fraction (ethanolic fraction) treated rats (at a dose level of 500 mg/kg b. w) and glibenclamide treated rats (10 mg/kg b. w) polyphagia and polydipsia significantly overcame that is the symptoms of diabetes. The diabetic control ones consumed less water and feed when compared with the extract and glibenclamide-treated rats. The effect of extracts and glibenclamide on feed and water consumption in rats shows in Table 5.

Table 4: Effect of the extracts of *Rosa centifolia* and glibenclamide on feed intake and fluid intake of the rats.

Group	Water consumption (mL/day)	Food consumption (g/day)
Normal	25.33±0.333	20.39±0.065
Diabetic control	64.33±0.333	29.94±0.200
Plant extract at second dose level (250 mg/kg)	45.00±1.00	25.00±1.155
Plant extract at third dose level	43.33±0.333	23.31±0.224

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 1529-1541 | ISSN:2251-6727

(500 mg/kg)		
Plant ethanolic fraction at second dose level (250 mg/kg)	43.00±1.528	22.33±0881
Plant ethanolic fraction at third dose level (500 mg/kg)	32.33±0.333	22.82±0.023
Standard drug (10 mg/kg Glibenclamide)	38.67±0.333	22.32±0.010

3.5 Effect of Extracts of Rosa centifolia and Glibenclamide on Body Weight in Rats

The body bodyweight belonging to the diabetic control group was drastically decreased upon the induction of diabetes. The ethanolic extract, the fraction of extract, and glibenclamide-treated rats were found to gain body weight significantly when compared with the diabetic control group as shown in Table 6.

Table 5: Effect of Rosa centifolia and glibenclamide extracts on body weight in streptozotocin-induced diabetic rats.

Group	Bodyweight (kg)		
	0th day	7th day	14th day
Normal	122.0±0.577	135.7±0.881	157.3±0.333
Diabetic control	129.3±0.888	118.7±0.333	108.3±1.202
Plant extract at second dose level (250 mg/kg)	123.0±1.155	133.3±1.764	141.7±1.202
Plant extract at third dose level (500 mg/kg)	122.3±0.881	129.3±0.881	138.0±0.577
Plant ethanolic fraction at second dose level (250 mg/kg)	124.3±1.202	130.3±1.453	140.3±0.881
Plant ethanolic fraction at third dose level (500 mg/kg)	122.3±1.202	131.3±0.881	143.3±1.667
Standard drug (10 mg/kg Glibenclamide)	122.3±1.333	132.3±1.202	141.7±0881

3.7 Histopathology

In this histopathological study, we observed three organs that are majorly damaged in the diabetic condition, and we recorded the visible difference in the normal and treated with an active fraction of *Rosa centifolia* petals extracts. The pathological report obtained from the study summarised in fig 6.2.3.6.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 1529-1541 | ISSN:2251-6727

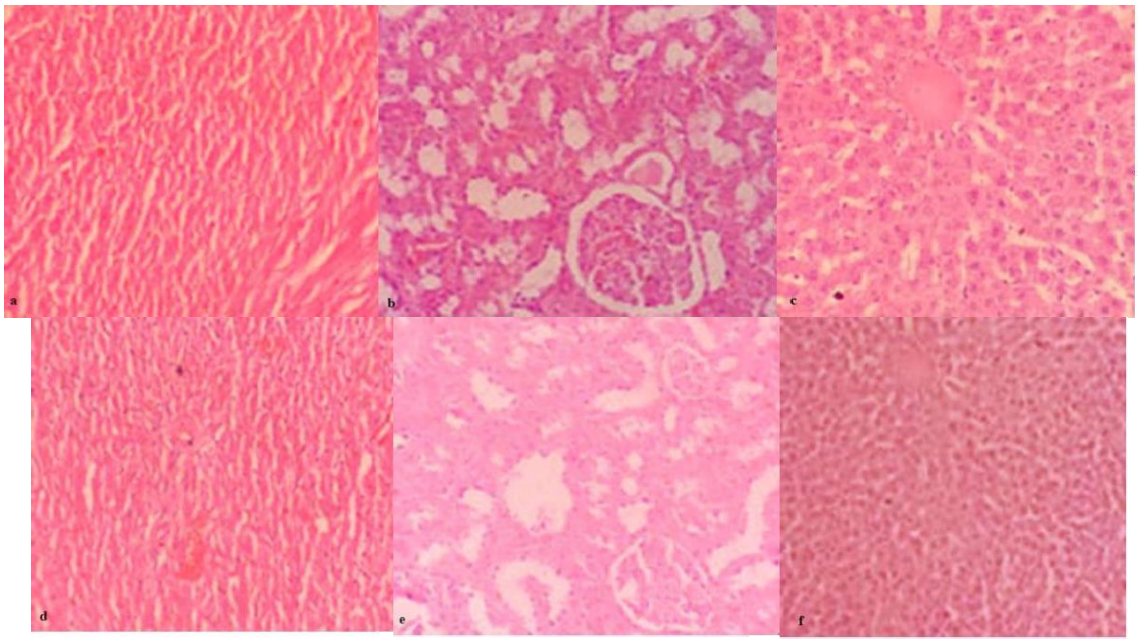

Fig. 1. (a) Normal cellular population in the heart of glibenclamide-treated (standard) rats. (b) Normal cellular population in the liver of glibenclamide-treated (standard) rats. (c) Normal cellular population in the kidney of glibenclamide-treated (standard) rats (10 mg/kg Glibenclamide). (d) Restoration of the normal cellular population in the heart of final fraction-treated (test) rats. (e) Restoration of the normal cellular population in the liver of final fraction-treated (test) rats. (f) Restoration of the normal cellular population in the kidney of final fraction-treated (test) rats (500 mg/kg final fraction of extract)

3.6 Oral Glucose Tolerance Test (OGTT)

Table 7 (a) shows the OGTT study; blood glucose concentration in all groups reached peak levels after 30min of glucose administration (2 g/kg) and then began to decrease. As compared to the normal group, the glucose levels of experimental animals (rats) treated with extracts and glibenclamide showed an abrupt reduction. The final fraction of ethanolic extract (500mg/kg of b. w) exhibited more significant antidiabetic activity than other fractions of extracts and glibenclamide-treated rats. Ethanolic and other fractions of extracts were found to lower the glucose levels in a dose-dependent pattern as represented in Table 7 (b).

Table 6: (a) Effect of extracts of *Rosa centifolia and* glibenclamide on glucose tolerance of rats. (b) Dose-dependent effect of ethanolic extract and a fraction of ethanolic extracts of *Rosa centifolia* on glucose tolerance of rats.

Table - a

Group	Blood glucose level mg/Dl				
	0 min	30 min	60 min	90 min	120 min
Normal	81.30±0.008	148.8±0.026	136.7±0.003	128.0±0.143	115.4±0.015
Plant extract at third dose level (500 mg/kg)	81.24±0.006	146.1±0.080	131.7±0.015	123.5±0.074	112.2±0.011
Plant ethanolic fraction at third dose level (500 mg/kg)	82.42±0.003	108.7±0.100	97.64±0.005	83.37±0.010	76.17±0.010
Standard drug (10	80.69±0.006	116.5±0.293	104.3±0.010	94.19±0.013	83.49±0.006

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 1529-1541 | ISSN:2251-6727

mg/kg Glibenclamide)					

Table - b

Group	Blood glucose level mg/dL				
	0 min	30 min	60 min	90 min	120 min
Normal	82.21±0.137	146.8±0.197	133.2±0.341	124.8±0.362	117.8±0.450
Plant extract at second dose level (250 mg/kg)	80.75±0.003	142.5±0.006	125.7±0.006	112.9±0.013	93.93±0.131
Plant extract at third dose level (500 mg/kg)	83.15±0.023	137.8±0.230	127.2±0.008	119.9±0.010	90.6±0.015
Plant ethanolic fraction at second dose level (250 mg/kg)	80.28±0.008	122.3±0.005	113.2±0.017	98.87±0.178	86.10±0.170
Plant ethanolic fraction at third dose level (500 mg/kg)	82.27±0.013	110.7±0.008	98.19±0.006	89.44±0.010	79.77±0.131
Standard drug (10 mg/kg Glibenclamide)	81.47±0.147	119.0±0.104	108.3±0.177	99.04±0.177	82.67±0.056

4. Discussion

Numerous Indian medicinal plants are reported to be useful in diabetes mellitus and some species of genus *Rosa* have been reported to have antidiabetic activity, anti-inflammatory, and anticancer antimicrobial [45]. In *rosa cannina and rosa demensa* the hydroethanolic crude extract at a dose of 200 and 400 mg/kg b. w and chloroform fraction (200 mg/kg b. w) administered orally for 15 days showed a significant reduction in blood glucose level [46]. Similar results were observed in our study that was carried out on *Rosa centifolia* where ethanolic and fraction of ethanolic extract produced a significant decrease in the serum glucose level at a dose of 250 mg/kg b. w. and 10 mg/kg b.w. respectively. The extracts also displayed an increased dose-dependent hypoglycaemic effect. The results also correlate with the study carried out on *Rosa centifolia*, where these studies suggest the commonness of bioactive principles among these related species, thus making them effective in the treatment of diabetes [47, 48]. Oxidative stress, a condition characterized by an increase in ROS in the body is known to be partly responsible for diabetes and its complications. Glucose protein glycation, formation of AGEs, autooxidation, and the polyol pathway are responsible for the genesis of oxidative stress in both diabetic patients as well as experimental diabetic animals [49]**.** Natural antioxidant defense systems impair or depress thus promoting oxidative stress due to the higher concentrations of glucose. DM affects the eyes as well due to an increase in oxidative stress levels by the process of glycation and oxidation lens proteins become denatured. Therefore, water-soluble protein levels decrease. An increase in free radicals causes the over-production of Malondialdehyde (MDA) it is a marker of polyunsaturated lipid peroxidation in cells, and it is usually known as a marker of oxidative stress. The mechanisms behind both the modern system of medicines and the traditional system of medicines to lower blood glucose concentration are: (1) to stimulate beta-cell of the pancreatic islet to release more insulin; (2) inhibit the action of hormones which increases blood glucose concentration; (3) increase the

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 1529-1541 | ISSN:2251-6727

sensitivity of insulin receptor site; (4) inhibit hydrolysis of glycogen in liver; (5) enhance the use of glucose in tissues and organ [50]. Enzymes like AST, ALT, and ALP are useful biomarkers for determining liver damage. Human and animal studies indicate that serum ALT, AST, and ALP levels increase with DM. Since the liver is the central metabolic organ in the body responsible for glucose and lipid homeostasis, diabetes leads to hepatic dysfunction. Streptozotocin-induced diabetes in rats causes the elevated activities of liver marker enzymes (SGPT, SGOT, and ALP) due to the reported destruction of hepatocytes [51, 52] In this part of our study, we evaluate the Antidiabetic potential of *Rosa centifolia* in the *in vivo* antidiabetic effects of rose petals. The present study demonstrated that Rats orally treated with the extracts of *Rosa centifolia* (ethanolic and fraction of ethanolic extracts each at a dose level of 250mg/kg b. w and 10 mg/kg b. w. respectively) were found to have deliberately reduced activities of these enzymes consequential less damage to hepatocytes. Streptozotocin-induced diabetic rats are associated with hyperlipidemia and increased levels of serum creatinine [53]. However, the extract-treated rats (ethanolic and fraction of ethanolic extracts each at a dose level of 250mg/kg of b. w and 10 mg/kg b. w. respectively) showed reduced levels of cholesterol, triglycerides, LDL, and serum creatinine when compared with the diabetic control group. The serum protein levels in diabetic rats were reduced as compared to the normal group, while the serum protein levels of treated rats (ethanolic and fraction of ethanolic extracts each at a dose level of 250mg/kg of b. w and 10 mg/kg b. w. respectively) were found to be higher than those of diabetic group indicating lowered protein degradation. There was a substantial reduction in the feed and water consumption in diabetic rats treated with ethanolic and fraction of ethanolic extracts of R*osa centifolia* (each at a dose level of 250mg/kg of b. w and 10 mg/kg b. w. respectively) when compared with the group of diabetic control animals. The body weight among the rats administered with the extracts of *Rosa centifolia* was found to be in an increasing manner possible due to the reduction in lowering of glucose levels thus sparing the body fat and muscle protein which otherwise are utilized in diabetic rats. The antidiabetic activity of the ethanolic extract may be due to the presence of the secondary metabolites (flavonoids, alkaloids, phenolics, glycosides, and terpenes) present in various concentrations in *Rosa centifolia.* These phytochemicals are reported to possess antidiabetic potential differently and are the recommended reason for the difference in activities of these extracts and fraction of extract [54, 55]. Numerous of the flavonoid's active components have been found to possess antidiabetic potential [56]. We also suggest the potent antidiabetic activity of ethanolic extract due to the presence of flavonoid compound(s) in it. The improved glycemic control in oral glucose tolerance tests by the extracts and fraction of extract of *Rosa centifolia* shows that the petal extracts also lower the serum glucose levels even in normal group rats. The increased efficiency of the peripheral tissues for the uptake of glucose from the blood, the subsequent effect of lowering blood glucose levels in normal group rats. Thus the extracts of *Rosa centifolia* also be useful in patients with type II diabetes.

5. Conclusion

The common symptoms of diabetes, that is, polyphagia, polydipsia, and weight loss, were found to be lessened by the extracts of *Rosa centifolia* (ethanolic extracts each at a dose level of 500mg/kg of b.w.) in diabetic rats. The extracts significantly reduced fasting glucose levels in diabetic rats and also reduced the lipid profile parameters in diabetic rats. The extracts were found to significantly decrease the activities of SGPT, SGOT, and ALP in diabetic rats. In conclusion, our histopathological investigation along with the biochemical evaluations suggests the strong antidiabetic potential of *Rosa centifolia,* there result is observed to show the effect on both the pancreatic β-cells and the blood glucose level. Further mechanistic studies are required to suggest the appropriate mechanism for the antidiabetic effect of the plant. In conclusion, our study indicates that the ethanolic extracts of Rosa centifolia exhibited activity both in normal and streptozotocin-induced diabetic rats and also increased the tolerance of animals on oral glucose tolerance tests.

Acknowledgement:

The authors gratefully acknowledge the Head of Pharmacy Department, Sam Higginbottom University of Agriculture, Technology and Sciences for providing the necessary guidance to conduct this research work. The authors are also grateful to the Department of Science and Technology (DST-FIST) Letter no-SR/FST/COLLEGE/2018/418, New Delhi for providing technical assistance.

References:

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 1529-1541 | ISSN:2251-6727

[1] Tran N;Pham B;Le L. Bioactive compounds in anti-diabetic plants: From herbal medicine to modern drug discovery. Biology (Basel), 2020,9,1–31.

[2] Akbarzadeh A;Norouzian D;Mehrabi M;Jamshidi S;Farhangi A;Allah Verdi A;et al. INDUCTION OF DIABETES BY STREPTOZOTOCIN IN RATS. vol. 22. 2007.

[3] Gudise V;Chowdhury B;Manjappa AS. Antidiabetic and antihyperlipidemic effects of Argyreia pierreana and Matelea denticulata: Higher activity of the micellar nanoformulation over the crude extract. J Tradit Complement Med, 2021,11,259–67.

[4] Jaiswal YS;Tatke PA;Gabhe SY;Vaidya AB. Antidiabetic activity of extracts of Anacardium occidentale Linn. leaves on n-streptozotocin diabetic rats. J Tradit Complement Med, 2017,7,421–7.

[5] Ramachandran S;Rajasekaran A;Adhirajan N. In Vivo and In Vitro Antidiabetic Activity of Terminalia paniculata Bark: An Evaluation of Possible Phytoconstituents and Mechanisms for Blood Glucose Control in Diabetes . ISRN Pharmacol, 2013,2013,1–10.

[6] Arora SK;Verma PR;Itankar PR;Prasad SK;Nakhate KT. Evaluation of pancreatic regeneration activity of Tephrosia purpurea leaves in rats with streptozotocin-induced diabetes. J Tradit Complement Med, 2021,11,435–45.

[7] Kazeem MI;Ashafa AOT. In-vitro antioxidant and antidiabetic potentials of Dianthus basuticus Burtt Davy whole plant extracts. J Herb Med, 2015,5,158–64.

[8] Shettar AK;Sateesh MK;Kaliwal BB;Vedamurthy AB. In vitro antidiabetic activities and GC-MS phytochemical analysis of Ximenia americana extracts. South African Journal of Botany, 2017,111,202–11.

[9] Rafe MR. A review of five traditionally used anti-diabetic plants of Bangladesh and their pharmacological activities. Asian Pac J Trop Med, 2017,10,933–9.

[10] Arise RO;Aburo OR;Farohunbi ST;Adewale AA. Antidiabetic and Antioxidant Activities of Ethanolic Extract of Dried Flowers of Moringa oleifera in Streptozotocin-induced Diabetic Rats. Acta Facultatis Medicae Naissensis, 2016,33,259–72.

[11] Can Baser KH;Kurkcuoglu M. Turkish rose. A review of the history, ethnobotany, and modern uses of rose petals, rose oil, rose water, and other rose products Natural Product Discovery View project Natural Volatiles and Essential Oils-NVEO View project. n.d.

[12] Mileva M;Ilieva Y;Jovtchev G;Gateva S;Zaharieva MM;Georgieva A;et al. Rose flowers—a delicate perfume or a natural healer? Biomolecules, 2021,11,1–32.

[13] Genetic diversity in chestnuts of Kashmir valley. n.d.

[14] Riaz A;Hameed M;Khan AI;Younis A;Awan FS. Assessment of biodiversity based on morphological characteristics and RAPD markers among genotypes of wild rose species. Afr J Biotechnol, 2011,10,12520–6.

[15] Nasir MH;Nadeem R;Akhtar K;Hanif MA;Khalid AM. Efficacy of modified distillation sludge of rose (Rosa centifolia) petals for lead(II) and zinc(II) removal from aqueous solutions. J Hazard Mater, 2007,147,1006–14.

[16] Kumar R;Nair V;Singh S;Gupta Y. In vivo antiarthritic activity of Rosa centifolia L. flower extract. AYU (An International Quarterly Journal of Research in Ayurveda), 2015,36,341.

[17] Priya Ashokrao T;Kiran D. International Journal of Ayurveda and Pharma Research A BRIEF REVIEW ON THERAPEUTIC EFFECTS OF-"ORNAMENTAL PLANT" ROSE. vol. 12. 2017.

[18] diab int 11 n.d.

[19] Bergfeld FACP;Donald V;Belsito DE;Cohen CD;Klaassen DC;Liebler ;et al. Safety Assessment of Rosa centifolia-derived Ingredients as Used in Cosmetics The Expert Panel for Cosmetic Ingredient Safety members are: Chair, Wilma F. n.d.

[20] Rose: Ornamental As Well As Medicinal Plant. n.d.

[21] Tanty H;Permai SD;Pudjihastuti H. In vivo anti-diabetic activity test of ethanol extract of the leaves of Cassia Siamea Lamk. Procedia Comput Sci, vol. 135, Elsevier B.V.; 2018, p. 632–42.

[22] Abdel-Hameed ESS;Bazaid SA;Salman MS. Characterization of the phytochemical constituents of taif rose and its antioxidant and anticancer activities. Biomed Res Int, 2013,2013.

[23] Shaibu Auwal M;Saka S;Alhaji Mairiga I;Abba Sanda K;Shuaibu A;Ibrahim A;et al. Preliminary phytochemical and elemental analysis of aqueous and fractionated pod extracts of Acacia nilotica (Thorn mimosa). vol. 5. 2014.

[24] In Vitro Antidiabetic and Anti-oxidant Activities of Methanol Extract of Tinospora Sinensis. J Appl Biol Biotechnol, 2017.

[25] Liu W;Chen L;Huang Y;Fu L;Song L;Wang Y;et al. Antioxidation and active constituents analysis of flower residue of Rosa damascena. Chin Herb Med, 2020,12,336–41.

[26] Abdel-Hameed ESS;Bazaid SA;Salman MS. Characterization of the phytochemical constituents of taif rose and its antioxidant and anticancer activities. Biomed Res Int, 2013,2013.

[27] Ghazanfar K;Ganai BA;Akbar S;Mubashir K;Dar SA;Dar MY;et al. Antidiabetic activity of artemisia amygdalina decne in streptozotocin induced diabetic rats. Biomed Res Int, 2014,2014.

[28] Mohammed SI;Chopda MZ;Patil RH;Vishwakarma KS;Maheshwari VL. In vivo antidiabetic and antioxidant activities of Coccinia grandis leaf extract against streptozotocin induced diabetes in experimental rats. Asian Pac J Trop Dis, 2016,6,298–304.

[29] Buddhakala N;Talubmook C. Toxicity and antidiabetic activity of ethanolic extract of Sphagneticola trilobata (L.) Pruski flower in rats. J Ethnopharmacol, 2020,262.

[30] Kumar R;Kumar Pate D;Kuldip Prasad S;Sairam K;Hemalatha S;Hemalatha S. Antidiabetic activity of alcoholic leaves extract of Alangium lamarckii Thwaites on streptozotocin-nicotinamide induced type 2 diabetic rats Asian Pacific Journal of Tropical Medicine Alangium lamarckii Antidiabetic activity Glucose tolerance test Streptozotocin *Corresponding author. 2011.

[31] Singh MP;Pathak K. Animal models for biological screening of anti-diabetic drugs: An overview. vol. 5. 2015.

[32] Singh MP;Pathak K. Animal models for biological screening of anti-diabetic drugs: An overview. vol. 5. 2015.

[33] Balamurugan K;Nishanthini A;Mohan VR. Antidiabetic and antihyperlipidaemic activity of ethanol extract of Melastoma malabathricum Linn. leaf in alloxan induced diabetic rats. Asian Pac J Trop Biomed, 2014,4,S442–8.

[34] Petchi R;Vijaya C;Parasuraman S. Antidiabetic activity of polyherbal formulation in streptozotocin- Nicotinamide induced diabetic wistar rats. J Tradit Complement Med, 2014,4,108–17.

[35] Varghese S;Kannappan P;Kanakasabapathi D;Madathil SR;Perumalsamy M. Antidiabetic and antilipidemic effect of Clerodendrum paniculatum flower ethanolic extract. An in vivo investigation in Albino Wistar rats. Biocatal Agric Biotechnol, 2021,36.

[36] Pandhare RB;Sangameswaran B;Mohite PB;Khanage SG. Antidiabetic Activity of Aqueous Leaves Extract of Sesbania sesban (L) Merr. in Streptozotocin Induced Diabetic Rats. vol. 3. n.d.

[37] Gandhi GR;Sasikumar P. Antidiabetic effect of Merremia emarginata Burm. F. in streptozotocin induced diabetic rats. Asian Pac J Trop Biomed, 2012,2,281–6.

[38] Jayaprasad B;Sharavanan PS;Sivaraj R. Antidiabetic effect of Chloroxylon swietenia bark extracts on streptozotocin induced diabetic rats. Beni Suef Univ J Basic Appl Sci, 2016,5,61–9.

[39] animal 17 n.d.

[40] Al-Attar AM;Alsalmi FA. Effect of Olea europaea leaves extract on streptozotocin

induced diabetes in male albino rats. Saudi J Biol Sci, 2019,26,118–28.

[41] Lartey NL;Asare-Anane H;Ofori EK;Antwi S;Asiedu-Larbi J;Ayertey F;et al. Antidiabetic activity of aqueous stem bark extract of Annickia polycarpa in alloxan-induced diabetic mice. J Tradit Complement Med, 2021,11,109–16.

[42] Kadali SRM;Das M;Vijayaraghavan R;Kumar MV. Evaluation of antidiabetic activity of aqueous and ethanolic extracts of leaves of chloroxylon swietenia in streptozotocin (STZ) induced diabetes in albino rats. Biomedical and Pharmacology Journal, 2017,10,1347–53.

[43] Khan MF;Rawat AK;Khatoon S;Hussain MK;Mishra A;Negi DS. In vitro and in vivo antidiabetic effect of extracts of Melia azedarach, Zanthoxylum alatum , and Tanacetum nubigenum. Integr Med Res, 2018,7,176–83.

[44] Haddad PS;Vianna R;Brault A;Martineau LC;Couture R;Arnason JT. In vivo anti-diabetic activity of the ethanolic crude extract of Sorbus decora C.K.Schneid. (Rosacea): A medicinal plant used by Canadian James Bay Cree nations to treat symptoms related to diabetes. Evidence-Based Complementary and Alternative Medicine, 2011,2011.

[45] Rahimi M;Sajadimajd S;Mahdian Z;Hemmati M;Malekkhatabi P;Bahrami G;et al. Characterization and anti-diabetic effects of the oligosaccharide fraction isolated from Rosa canina in STZ-Induced diabetic rats. Carbohydr Res, 2020,489.

[46] Orhan N;Aslan M;Hoşbaş S;Deliorman Orhan D. Antidiabetic effect and antioxidant potential of Rosa canina fruits. Planta Med, 2009,75.

[47] Gholamhoseinian A;Fallah H;Sharifi far F. Inhibitory effect of methanol extract of Rosa damascena Mill. flowers on α-glucosidase activity and postprandial hyperglycemia in normal and diabetic rats. Phytomedicine, 2009,16,935–41.

[48] Sanjari M;Gholamhoseinian Najar A;Asadikaram G;Mashayekhi M;Tafreshi AG. The Safety and Efficacy of Rosa Damascena Extract in Patients with Type II Diabetes: preliminary Report of a Triple Blind Randomized Acarbose Controlled Clinical Trial. vol. 26. 2019.

[49] Biotek A;Sivaraj C. Antibacterial Activities and GC-MS Analysis of Fresh Rose Petals Aqueous Extract of Rosa damascena Mill L. Journal of Drug Delivery and Therapeutics, 2019,9,68–77.

[50] Tran N;Pham B;Le L. Bioactive compounds in anti-diabetic plants: From herbal medicine to modern drug discovery. Biology (Basel), 2020,9,1–31.

[51] Demirbolat I;Ekinci C;Nuhoğlu F;Kartal M;Yildiz P;Geçer MÖ. Effects of orally consumed rosa damascena mill. Hydrosol on hematology, clinical chemistry, lens enzymatic activity, and lens pathology in streptozotocin-induced diabetic rats. Molecules, 2019,24.

[52] dissc 2 n.d.

[53] Moqbel FS;Naik PR;Habeeb N;Selvaraj M. Antidiabetic properties of Hibiscus rosa sinensis L. leaf extract fractions on non-obese diabetic (NOD) mouse. vol. 49. 2011.

[54] Salehi B;Ata A;Kumar NVA;Sharopov F;Ramírez-Alarcón K;Ruiz-Ortega A;et al. Antidiabetic potential of medicinal plants and their active components. Biomolecules, 2019,9.

[55] Sekhon-Loodu S;Rupasinghe HPV. Evaluation of antioxidant, antidiabetic and antiobesity potential of selected traditional medicinal plants. Front Nutr, 2019,6.

[56] Guleria H;Vaidya M. International Journal of Green and Herbal Chemistry An International Peer Review E-3 Journal of Sciences Available online atwww.ijghc.com Section B: Herbal Chemistry Research Article CODEN (USA): IJGHAY 55 IJGHC 2014,4,55–9.