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PHYTOCHEMICAL CONSTITUENTS AND ANTIDIABETIC PROPERTIES OF *SYZYGIUM CUMINI* LINN. SEED

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Keywords:

Antidiabetic, *Syzygium cumini* seed, Herbal medicine, Streptozotocin, Type 2 diabetic model rats

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ABSTRACT: The present study was undertaken to investigate some organic phytochemicals, fatty acids, toxic metals and evaluate lipidemic and antidiabetic activity of a herbal medicine and its one constituent *Syzygium cumini* seed. Antidiabetic and lipidemic activity of this medicine and seed extract was studied on streptozotocin induced type 2 diabetic model rats. From chemical investigation carbohydrates and steroids were present in both samples. Alkaloid was present in herbal medicine sample only. Arsenic was found to be 0.05 ppm which was less than the tolerance level. Other toxic metals Lead, Copper, Cadmium and Manganese were absent in herbal medicine (HM-01). Myristic, palmotelic, palmitic, linoleic, oleic, stearic and arachidic acids were found in both samples. The rats were divided into 4 groups (n = 6 in each group): a) Water control b) Glibenclamide c) PESE d) HM-01. The parameters measured were: serum glucose and serum lipid profile. Oral consumption of HM-01 and PESE for 22 days caused significant (plasma glucose in mmol/L, Mean ± SD; 8.57± 1.09 *vs* 5.67 ± 0.45; and 8.91 ± 0.9 *vs* 5.56 ± 0.7 respectively, on the 1st day *vs* 22nd day; **p < 0.005) reduction of fasting serum glucose level. HM-01 and PESE treated groups decreased total cholesterol level by 25% and 23%; triglyceride by 24% and 28%; LDL cholesterol by 34% and 35%; and increased HDL cholesterol by 14% and 22% respectively. The herbal medicine and its constituent *Syzygium cumini* seed powder possess antidiabetic properties in type 2 diabetic model rats.

INTRODUCTION: According to WHO, about 2.8% of the world population and 6% of the people of Bangladesh are suffering from diabetes mellitus. Diabetes mellitus (DM) is one of the most prevalent and devastating chronic non-communicable diseases having serious health, economic and social consequences (IDF, 2006).

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The minimum defining feature to identify diabetes mellitus is chronic and substantiated elevation of circulating glucose concentration [1]. Type 1 diabetes mellitus is characterized by beta cell destruction caused by an autoimmune process, usually leading to absolute insulin deficiency [2].

These are subdivided into Immune-mediated diabetes and Idiopathic diabetes. Over 90 percent of people who have diabetes have Type 2 Diabetes Mellitus. The onset is usually in middle age and in most cases is thought to be due to some form of insensitivity to the action of insulin rather to insulin deficiency [3]. Obesity is found in approximately 55% of patients diagnosed with Type 2 diabetes [4].

For diagnosis Impaired Glucose Tolerance (IGT) and Impaired Fasting Glycaemia (IFG) are commonly heard names. The clinical menifestations of diabetes in order in which they usually appear are: Polyuria, polydipsia, polyphagia, rapid weight loss, visual disturbances, slow healing, paraesthesia in the hands or feet[5]. There can be many severe complications due to Diabetes mellitus like Hypoglycemia, HHS, DKA, Retinopathy, Neuropathy, Nephropathy, CAD and Stroke [6]. Diabetes treatment can be insulin or oral agents.

Herbal drugs have been used since ancient times as medicines for the treatment of a range of diseases. Medicinal plants have played a key role in world health. Diabetes has long been a clinical model for general medicine. The primary defect in fuel metabolism results in widespread, multi organ complications that ultimately encompass virtually every system of the body and every specialty of medicine. Existing conventional therapeutic agents are still suffering from severe limitations. The active principles of herbal medicines are frequently unknown. The use of ethnobotanicals has a long folkloric history for the treatment of blood sugar abnormalities. More than 1200 species of plants have been used ethnopharmacologically or experimentally to treat symptoms of diabetes [7].

Jaam Plant

A branch of jam tree with flower

Jamun or Jam Fruit ripen (black)

Jaam Seed

FIG. 1: PICTURES OF THE *SYZYGIUM CUMINI* PLANT, FLOWER, FRUIT AND SEED

Syzygium cumini L. (synonym *Eugenia jambolan* Linn.) is a very large evergreen tropical tree belonging to the family Myrtaceae [8]. The native home of the *Syzygium cumini* is Bangladesh, India, Pakistan, Sri Lanka and East Indies. The tree was introduced in Florida, USA in 1911 by the USDA. It is known to have antimicrobial, gastroprotective, antiulcerogenic, anti-inflammatory, hypolipidemic, immunomodulatory, antioxidant and many more activities. In recent years increasing number of Bangladeshi people are using the seed powder of *Syzygium cumini* for the management of diabetes. Previous studies have shown that pulp, seed powder, leaves and also the bark of *Syzygium cumini* is used for management of diabetes. It is also found that the petroleum ether of *Syzygium*

cumini seed powder is highly effective than other extracts like methanol, dichloromethane and water extract. Some names of the Antidiabetic Herbal medicines containing *Syzygium cumini* as an active ingredient are Diabecon, Pancreatic tonic, Dia-care, Diabeta, Insu control, Diabetes Chaina Gold *etc*. So, the present study involved about hypoglycemic effect of *Syzygium cumini* seed powder.

MATERIALS AND METHODS:

Solvents and Chemicals: Analytical and laboratory grade (*e.g.* SIGMA, E. Merck or BDH) solvents and chemicals were used in most of the experiments. Analytical and laboratory grade of n-Hexane, Dichloromethane, Ethyl Acetate, Methanol, Ethanol, Acetone, Petroleum Ether and others are used in extraction. Extra pure or HPLC grade solvents are used in case of Column chromatography and GC experiments.

Name of Other Reagents: Chloroform, Sulphuric acid, Hydrochloric acid, Sodium bi carbonate, Sodium sulphate (anhydrous), Magnesium sulphate, Heptadecanoic acid, n-Heptane, Diethyl ether, Rectified spirit, Benzene, Potassium Hydroxide, Boron trifluoride methanol complex, Glacial acetic acid, Iodine, Benzoic acid, Silica gel (TLC grade), Silica gel 60 (0.063 - 0.200) mesh, for column chromatography.

Evaporating apparatus and Evaporation: The evaporation of solvents was carried out under reduced pressure (below 40 °C) by using R-114 type vacuum rotator evaporator (Germany) installed with a BUCHI, B-481 water bath (Switzerland). Low pressure was maintained with the help of a 0.25 H.P vacuum pump (England).

Freeze-Drying: Freeze drying of aqueous extracts and fractions were carried out by a HETOSIC 52 (Hetolab equipment, Denmark) model freeze dryer. Before freeze drying organic solvents were completely removed by evaporation and using a vacuum pump aqueous fractions were first frozen in round bottom flasks in a methanol freezer at 30°C to 40 °C and finally the materials were subjected to freeze-drying.

In chromatographic methods, Thin Layer Chromatography (TLC) and Column chromato-graphic techniques are used.

Herbal Medicine Materials:

Collection of Herbal Medicine: Antidiabetic herbal medicine HM-01 was brought from local herbal and pharmaceutical medicinal shop. The medicine was being used for antidiabetic disease. This is in capsule (powder) form. One box (pot) contains 20 capsules.

Analysis of Herbal Medicine: The powder (capsule contain) is greenish yellow in color with a sweet smell and flavor of plant materials.

TABLE 1: PLANT WITH AMOUNT USED TO PREPARE THE MEDICINE

Name of the Plants	Amount of plants in each 5 mg capsule
Syzygium cumini seed	35.71mg
Gymnema sylvestre leaves	35.71mg
Azadirachta indica leaves	25.65mg
Zingiber officinale (Ginger)	25.65mg
And other ingredients according to B.N.U.F	Formula of Unani medicine

Test for Steroids: The sample HM-01 was dissolved in minimum volume of chloroform and then concentrated sulphuric acid was added to the solution. A characteristic red color was observed. Finally a greenish color was observed in the chloroform layer when two drops of acetic anhydride was added indicating the steroidal nature of the sample.

Test for Alkaloids: The sample HM-01 (10 mg) was taken into a beaker and added 30 mL of distilled water. The sample solution was light greenish in color. Then small amount of conditioned charcoal was added to it. Then the beaker was shaked for a few minutes. After that it was filtered. Filtrate was colorless. About 0.5 mL filtrate was mixed with 5 mL 1% HCl then it was filtered. About 1 mL filtrate was taken into a test tube and added 3 drops of Dragendorff's reagent. Characteristic color of alkaloid was observed.

Extraction of Herbal Medicine with Different Solvents:

Extraction of HM-01 with 80% Ethanol: The powder of herbal medicine (40 g) was taken into 1000 mL conical flask. Then it was extracted with 80% ethanol (500 mL) for 24 hr. Then it was filtered and again extracted by similar process twice. The combined extract was filtered and evaporated to dryness at 40 °C temperatures. Then

the concentrated extract was collected into 20 mL vial and weighted. The concentrated extract was stored for further experiment. Weight of the ethanol extract was 1.0245 g. The same processes were repeated to the Extraction of HM-01 with n- hexane (Weight of the n-hexane extract was 0.9246 g), Dichloromethane (Weight of the Dichloromethane extract was 0.6019 g) and with Ethyl acetate (Weight of the Ethyl acetate extract was 0.4012 g).

Fatty Acid Analysis from Herbal Medicine:

Isolation of Fatty Acid from n-hexane Extract of HM-01: For isolation of free fatty acid n-hexane extract was hydrolyzed with methanolic potassium hydroxide. Potassium hydroxide of 2.8 g dissolved in 100 mL volumetric flask with 95% methanol. Then it was filtered. Then solution was prepared fresh before use. About 500 mg n-hexane extract of herbal medicine was taken into 250 mL round bottom flask and saponified with 35 mL 0.5 M potassium hydroxide (methanolic). Then it was placed on water bath at 70 ºC - 85 ºC and refluxed for half an hour by using a condenser. After cooling the solution was diluted with equal volume of water and was extracted with 50 mL of n-hexane. The aqueous part was separated and acidified with concentrated HCl acid to pH 2.5 as ascertained with a pH meter. The librated fatty acids (a mixture) were extracted with 40 - 50 mL n-hexane. Then it is repeated twice with same volume of n-hexane. Small amount water was removed by adding anhydrous sodium sulphate. The n-hexane extract contain fatty acid devoid of water was collected in reaction tube and evaporated to dryness under nitrogen. Thus free fatty acid was collected.

Plant Materials:

Collection of *Syzygium cumini* seed The selected Antidiabetic herbal medicine contains *Syzygium cumini* seed powder. So *Syzygium cumini* seed was brought from local herbal medicinal plant shop. The seed was dried in sun heat. When it was free from moisture, then it was prepared to make powder. The *Syzygium cumini* seed powder is light yellow in color with a sweet smell and flavour of plant materials.

Test for Steroids: The charcoal treated concentrated sample (*Syzygium cumini* seed powder) was dissolved in minimum volume of chloroform and then concentrated sulphuric acid was added to the solution. A characteristic red color was observed. Finally a greenish color was observed in the chloroform layer when two drops of acetic anhydride was added indicating the steroidal nature of the sample.

Test for Alkaloids: The *Syzygium cumini* seed powder (10 mg) was taken into a beaker and added 30 mL of distilled water. The sample solution was light greenish in color. Then small amount of conditioned charcoal was added to it. Then the beaker was shacked for a few minutes. After that it was filtered. Filtrate was colorless. About 0.5 mL filtrate was mixed with 5 mL 1% HCl the it was filtered. About 1 mL filtrate was taken into a test tube and added 3 drops of Dragendorff's reagent. Characteristic color of alkaloid was observed.

Extraction Process:

Extraction of *Syzygium cumini* Seed Powder with Petroleum Ether: The *Syzygium cumini* seed powder (200 g) was taken into white cotton bag and then it was placed in a Soxhlet apparatus. Then it was extracted with petroleum ether (1000 mL) for 24 hr. Then it was filtered and again extracted by similar process for twice. The combined extract was filtered and evaporated to dryness at 40 ºC temperatures. Then the concentrated extract was collected into 20 mL vial and weighted. Weight of the petroleum ether extract was 20.92 g. The concentrated extract was stored for further experiment. Then the fatty acid is isolated following almost the same procedure of HM-01. FAME is produced and quantification of fatty acids is done through Gas chromatography (GC).

Biological Materials and Methods:

Preparation of Petroleum Ether Freeze Dried Extract of *Syzygium cumini* Seed Powder: 1500 g of dry seed powder were dissolved in 1500 mL petroleum ether for 24 hr. These suspensions were filtered with thin and clean cloth and then filtered by Whatman filter paper number 1. Then the extract was concentrated with a rotary evaporator at 40 ºC. The concentrated part was freeze dried by HETOSIC-52. The dried extract weighted 51.45 g.

Dose and Route of Administration: For the evaluation of the antidiabetic activity, the petroleum ether extract of *Syzygium cumini* seed powder was administered orally at a dose of 1.25

g/kg body weight for 22 days. For all the pharmacological studies, the herbal medicine and drug glibenclamide administered as a positive control, at a dose of 5 mg/kg body weight for type 2 diabetes model rats.

Animal Models: The experiments for antidiabetic activity were carried out on Long-Evans rats (210-230 g) of all female, bred at BIRDEM animal house and maintained at a constant room temperature of 22 ± 5 ºC with humidity of 40 - 70% and the natural day-night cycle, fed on a standard laboratory pellet diet and water supplied *ad libitum*, access to food except during the day of experimental procedure. The influence of circadian rhythms was avoided by starting all experiments at 8.30 hr. A total number of 24 rats were used to carry out the experiments, which include only type II diabetic model rats. Each type of experimental models was divided into four groups.

These include: 1) Water control group 2) Glibenclamide control group 3) Petroleum ether extract of *Syzygium cumini* seed powder fed group (PESE) 4) Herbal Medicine (HM-01) fed group. Each individual group contained 6 rats, matched with body weight and sex. Before starting an experiment, the animals were weighed and carefully marked on the tail which was later used as identification mark for a particular rat, so that the response of a particular rat before and after the drug administration could be noted separately.

Induction of Type II Diabetes: Type II diabetes was induced by a single intraperitoneal injection of streptozotocin (STZ) at a dose of 90 mg/kg body weight in Citrate Buffer (10 mL) to the 48 hr old rat pups (average weight 7 g) as described by Bonner of Weir *et al*., [9] Experiments were carried out 3 months after STZ injection and rats having blood glucose level 7 - 12 mmol/L at fasting conditions, these were taken to carry out the experiments. Then study on chronic hypoglycemic activity is done through the study of chronic effect on fasting serum glucose level and serum lipid profile and body weight. Collections of blood sample were done by amputation of the tail tip under pentobarbital anesthesia. They were centrifuged after 20 minutes and the serums were separated and taken into another eppendorf.

Various analytical methods were applied like 1) Serum glucose estimation by Glucose Oxidase (GOD-PAP) method by using micro-plate reader [10] 2) Serum total cholesterol by enzymatic colorimetric (Cholesterol Oxidase / Peroxidase) method using autoanalyzer, auto lab [11] 3) Serum high-density lipoprotein (HDL) by enzymatic colorimetric method using micro-plate reader [12] 4) Serum Low Density Lipoprotein (LDL) by Friedewald formula [13] 5) Serum triglyceride (TG) by enzymatic colorimetric method using autoanalyzer.

Statistical Analysis: Statistical analysis was performed using SPSS (Statistical Package for Social Science) software for Windows version 12 (SPSS Inc., Chicago, Illinois, USA). All the data were expressed as mean ± SD (Standard deviation), and/or percentage (%) as appropriate. The statistical significance of differences between the values was assessed by unpaired t test. Correlation was also shown among the parameters. A two-tailed p value of <0.05 was considered statistically significant.

RESULTS AND DISCUSSION: In this respect one herbal medicine (HM-01) was selected from a recognized company for chemical and biological study. For secrecy, the trade name of the medicine was not mentioned anywhere. The ingredients of this medicine was *Syzygium cumini* seed, *Gymnema sylvestre* leaves, *Azadirachta indica* leaves, *Zingiber officinale* (Ginger) and other ingredients according to B.N.U.F formula of Unani medicine. The powder of herbal medicine was extracted with different solvent system. Its hexane extract gave oily substances. The *Syzygium cumini* seeds also contain oily substances. From animal model trial, it was found that the petroleum ether soluble fraction of the seed of *Syzygium cumini* was highly effective in controlling hypoglycemia with no problematic effects on the liver, heart, kidney and spleen tissues [14]. Therefore, the present study was involved to analyse the organic phytochemicals, fatty acid of the HM-01 and *Syzygium cumini* seed. The present study was also involved to observe the hypoglycemic and lipidemic status of the selected medicine and *Syzygium cumini* seed on type II diabetic model rats.

STZ- induced diabetic rats were chosen as the animal model because it resembles many of the features of human diabetes mellitus [14 - 15].

Organic Phytochemical Analysis:

Herbal Medicine: Preliminary phytochemical analysis of the herbal medicine has been performed to detect the phytoconstituents like; alkaloid, carbohydrate, steroid etc. From this analysis, it was found that carbohydrate, alkaloids and steroids were present.

***Syzygium cumini* Seed Powder:** Preliminare phytochemical analysis detected the presence of carbohydrate and steroid, but alkaloid was absent here.

Toxic Metal Analysis from HM-01: Only little (0.05 ppm) Arsenic was found which is less than the tolerance level.

Extraction of Herbal Medicine Powder: The amount of ethanol extract was 1.0245 g, n-hexane extract was 0.9246 g, Dichloromethane and Ethyl acetate extract 0.6019 g and 0.4012 g respectively.

Syzygium cumini seed powder was extracted by petroleum ether and Fractionaltions and Isolations of fatty acids were done later through various techniques and were analyzed by chromatography.

RESULTS:

Chronic Effect of Herbal Medicine (HM-01) and Petroleum Ether Extract of *Syzygium cumini* Seed Powder (PESE) on Body Weight (BW) of Type 2 Diabetic Model Rats: The effect of petroleum ether extract of *Syzygium cumini* seed powder and HM-01 on body weight of type 2 diabetic model rats during 21 days of chronic oral administration is presented in the **Table 2** and **Fig. 2**.

TABLE 2: CHRONIC EFFECT OF HERBAL MEDICINE (HM-01) AND PETROLEUM ETHER EXTRACT OF *SYZYGIUM CUMINI* SEED POWDER (PESE) ON BODY WEIGHT (BW) OF TYPE 2 DIABETIC MODEL RATS

Group	BW_0 day (g)	BW_7th day (g)	BW_14th day (g)	BW_22nd day (g)
Water control (n=6)	183 ± 17	184 ± 14	190 ± 15	193 ± 15
	100%	101%	104%	106%
Glibenclamide (n=6)	190 ± 20	187 ± 16	183 ± 18	176 ± 20
	100%	98%	96%	93%
PESE (n=6)	186 ± 23	182 ± 21	190 ± 25	194 ± 20
	100%	98%	102%	104%
HM-01(n=6)	197 ± 21	195 ± 17	200 ± 15	206 ± 27
	100%	99%	102%	105%

PESE = petroleum ether extract of *Syzygium cumini* seed powder, HM-01 = Herbal medicine. Results are expressed as mean ± Standard Deviation (SD), n = number of rats.

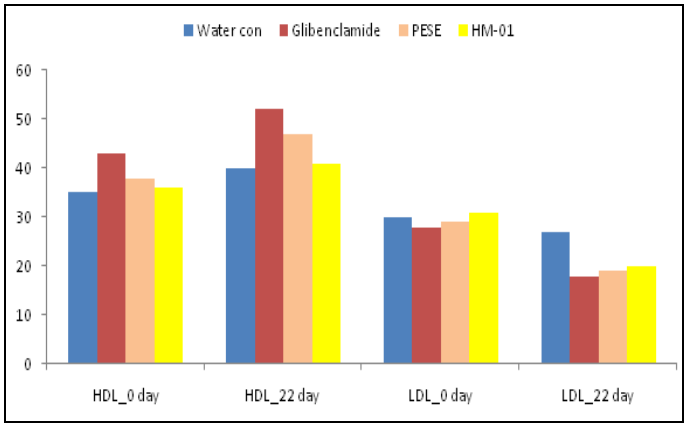

FIG. 2: CHRONIC EFFECT OF HERBAL MEDICINE (HM-01) AND PETROLEUM ETHER EXTRACT OF *SYZYGIUM CUMINI* SEED POWDER (PESE) ON BODY WEIGHT (BW) OF TYPE 2 DIABETIC MODEL RATS

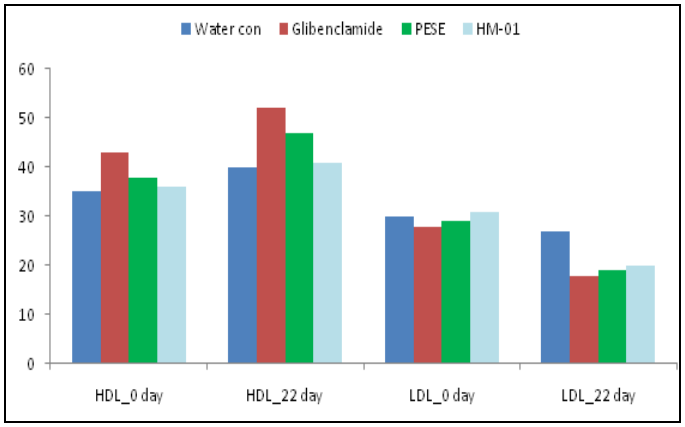

FIG. 3: CHRONIC EFFECT OF PETROLEUM ETHER EXTRACT OF *SYZYGIUM CUMINI* SEED POWDER (PESE) AND HERBAL MEDICINE (HM-01) ON GLYCEMIC STATUS TYPE 2 DIABETIC MODEL RATS ON 22nd DAY

Chronic Effect of Petroleum Ether Extract of *Syzygium cumini* Seed Powder (PESE) and Herbal Medicine (HM-01) on Serum Cholesterol and Triglyceride Levels of STZ-Induced Type 2 Diabetic Model Rats: Chronic effect of petroleum ether extract of *Syzygium cumini* seed powder

(PESE) and herbal medicine (HM-01) on serum cholesterol and triglyceride levels of STZ-induced Type 2 diabetic model rats are summarized in the **Table 4** and **Fig. 4** below;

TABLE 3: CHRONIC EFFECT OF PETROLEUM ETHER EXTRACT OF *SYZYGIUM CUMINI* SEED POWDER (PESE) AND HERBAL MEDICINE (HM-01) ON GLYCEMIC STATUS TYPE 2 DIABETIC MODEL RATS ON 22nd DAY

Group	Glu_0 day (mmol/L)	Glu _7th day (mmol/L)	Glu _14th day (mmol/L)	Glu _22nd day (mmol/L)
Water control (n=6)	7.88 ± 1.02	7.93 ± 1.11	8.19 ± 2.79	8.09 ± 2.71
	100%	101%	103%	112%
Glibenclamide (n=6)	8.82 ± 1.08	6.67 ± 2.13	6.25 ± 1.67*	5.33 ± 0.59**
	100%	90%	86%	80%
PESE (n=6)	8.57 ± 1.09	6.92 ± 0.96	6.09 ± 0.71*	5.67 ± 0.45**
	100%	88%	82%	71%
HM-01(n=6)	8.91 ± 0.09	6.81 ± 1.1	6.02 ± 1.15	5.56 ± 0.70**
	100%	90%	81%	74%

PESE = petroleum ether extract of *Syzygium cumini* seed powder, HM-01 = Herbal medicine. Results are expressed as mean ± Standard Deviation (SD), n = number of rats. Statistical analysis within groups was done using paired "t"- test and between groups comparison was done using one way ANOVA with post Hoc Bonferroni test. (* = $p < 0.05$); (** = $p < 0.005$)

TABLE 4: CHRONIC EFFECT OF PETROLEUM ETHER EXTRACT OF *SYZYGIUM CUMINI* SEED POWDER (PESE) AND HERBAL MEDICINE (HM-01) ON SERUM CHOLESTEROL AND TRIGLYCERIDE LEVELS OF STZ-INDUCED TYPE 2 DIABETIC MODEL RATS

Group	Cho_0 day (mg/dL)	Cho_22 day (mg/dL)	TG_0 day (mg/dL)	TG_22 day (mg/dL)
Water control (n=6)	79 ± 16	73 ± 11	71 ± 22	64 ± 14
	100%	92%	100%	96%
Glibenclamide (n=6)	81 ± 18	65 ± 9	77 ± 17	59 ± 11
	100%	80%	100%	77%
PESE (n=6)	88 ± 19	70 ± 8	76 ± 14	55 ± 4
	100%	77%	100%	72%
HM-01(n=6)	85 ± 14	64 ± 8	79 ± 15	60 ± 10
	100%	75%	100%	76%

PESE = petroleum ether extract of *Syzygium cumini* seed powder, HM-01 = Herbal medicine. Results are expressed as mean ± Standard Deviation (SD), n = number of rats

Chronic Effect of Herbal Medicine (HM-01) and Petroleum Ether Extract of *Syzygium cumini* Seed Powder (PESE) on Serum HDL-C and LDL-C Levels of STZ-induced Type 2 Diabetic Model Rats: Chronic effect of herbal medicine (HM-01) and petroleum ether extract of *Syzygium cumini* seed powder (PESE) on serum HDL-C and LDL-C levels of STZ-induced Type 2 diabetic model rats are summarized in the **Table 5** and **Fig. 5** below;

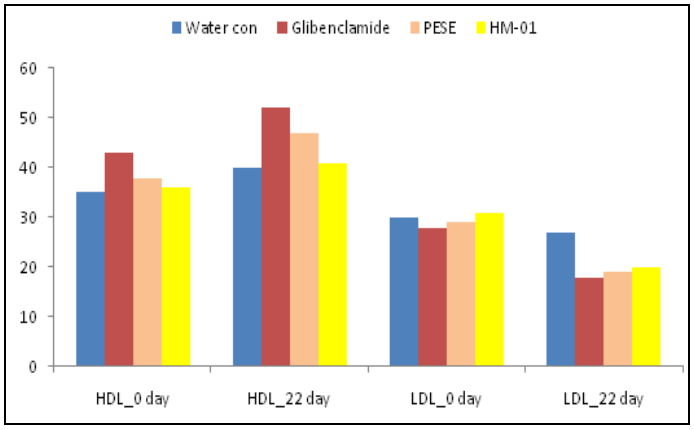

FIG. 4: CHRONIC EFFECT OF PETROLEUM ETHER EXTRACT OF *SYZYGIUM CUMINI* SEED POWDER (PESE) AND HERBAL MEDICINE (HM-01) ON SERUM CHOLESTEROL AND TRIGLYCERIDE LEVELS OF STZ-INDUCED TYPE 2 DIABETIC MODEL RATS

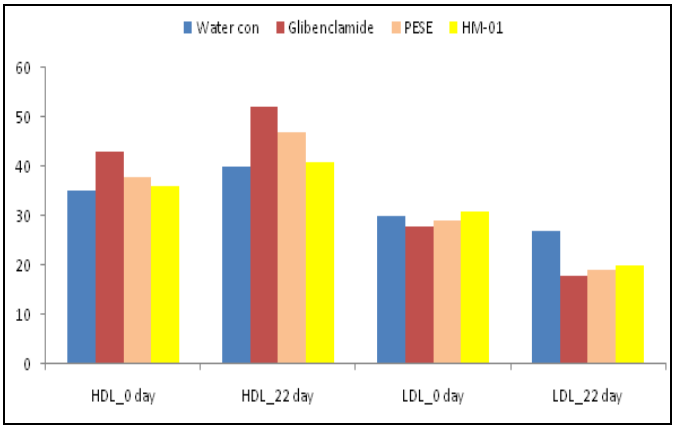

FIG. 5: CHRONIC EFFECT OF HERBAL MEDICINE (HM-01) AND PETROLEUM ETHER EXTRACT OF *SYZYGIUM CUMINI* SEED POWDER (PESE) ON SERUM HDL-C AND LDL-C LEVELS OF STZ-INDUCED TYPE 2 DIABETIC MODEL RATS

TABLE 5: CHRONIC EFFECT OF HERBAL MEDICINE (HM-01) AND PETROLEUM ETHER EXTRACT OF *SYZYGIUM CUMINI* SEED POWDER (PESE) ON SERUM HDL-C AND LDL-C LEVELS OF STZ-INDUCED TYPE 2 DIABETIC MODEL RATS

Group	HDL_0 day (mg/dL)	HDL _22 day (mg/dL)	LDL _0 day (mg/dL)	LDL _22 day (mg/dL)
Water control (n=6)	36 ± 11	39 ± 13	31 ± 8	28 ± 9
	100%	108%	100%	90%
Glibenclamide (n=6)	42 ± 9	49 ± 7	29 ± 10	19 ± 5
	100%	117%	100%	66%
PESE (n=6)	37 ± 6	45 ± 3	31 ± 11	20 ± 4
	100%	122%	100%	65%
HM-01(n=6)	35 ± 8	40 ± 10	32 ± 6	21 ± 7
	100%	114%	100%	66%

PESE = petroleum ether extract of *Syzygium cumini* seed powder, HM-01 = Herbal medicine. Results are expressed as mean ± Standard Deviation (SD) and compared using paired "t" test, n = number of rats

The most important finding is that, after 21 days of consecutive feeding, when the rats were sacrificed on the 22nd day, a significant reduction in the fasting glucose level was observed in both of the *Syzygium cumini* seed powder (PESE) and extract fed groupd compared with the water control group. In this experiment, glibenclamide treated group which was considered as positive control group also significantly decreased fasting blood glucose level after chronic feeding. Beneficial changes in lipid profile have also been observed.

The results showed that herbal medicine (HM-01) and *Syzygium cumini* seed powder extract for 21 days of chronic feeding significantly increased serum HDL-cholesterol but decreased total cholesterol, triglyceride and LDL-cholesterol. Thus *S. cumini* seed powder and ethanol extract have potential antihyperlipidemic effect in type 2 diabetic model rats. The observed results are supported by findings of other investigators [16].

CONCLUSION: The present study was undertaken to assess the phytochemicals, fatty acid analysis, antidiabetic and antihyperlipidemic effect ofherbal medicine and its one constituent *Syzygium cumini* seed powder in type 2 diabetic model rats. From the obtained data it may be concluded that, some phytochemicals *e.g.* carbohydrates and steroids were present in both the herbal medicine and *Syzygium cumini* seed powder. Alkaloids were present in HM-01 but absent in PESE. Toxic metals were almost absent in both cases. Fatty acid analysis conclusively demonstrated that myristic, palmotelic, palmitic, linoleic, oleic, stearic and arachidic acids were found in both cases but their relative percentages were different.

From biological study, it may be summerrized that herbal medicine (HM-01) and petroleum ether extract of *Syzygium cumini* seed powder (PESE) possess antidiabetic properties in type 2 diabetic model rats by decreasing blood glucose level. HM-01 and PESE treated groups decreased total cholesterol level by 25% and 23%; triglyceride by 24% and 28%; LDL cholesterol by 34% and 35% and increased HDL cholesterol by 14% and 22% respectively. Therefore, herbal medicine (HM-01) and petroleum ether extract of *Syzygium cumini* seed powder (PESE) may be useful, safe and cheap in the treatment of type 2 diabetese.

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CONFLICT OF INTEREST: We declare no conflict of interest for this research.

REFERENCES:

1. Peters AL, Ahmann AJ, Battelino T, Evert A, Hirsch IB, Murad MH, Winter WE and Wolpert H: Diabetes Technology - Continuous Subcutaneous Insulin Infusion Therapy and Continuous Glucose Monitoring in Adults: An Endocrine Society Clinical Practice Guideline. The Journal of Clinical Endocrinology and Metabolism 2016; 101(11): 3922-3937.
2. Vigersky R and Shrivastav M: Role of continuous glucose monitoring for type 2 in diabetes management and research. Journal of Diabetes and its Complications 2017; 31(1): 280-287.
3. Inzucchi SE, Bergenstal RM, Buse JB, Diamant M, Ferrannini E, Nauck M, Peters AL, Tsapas A, Wender R

and Matthews DR: Management of Hyperglycemia in Type 2 Diabetes, 2015: A Patient-Centered Approach: Update to a Position Statement of the American Diabetes Association and the European Association for the Study of Diabetes. Diabetes Care 2015; 38(1): 140-149.

4. Esser N, Legrand-Poels S, Piette J, Scheen AJ and Paquot N: Inflammation as a link between obesity, metabolic syndrome and type 2 diabetes. Diabetes Research and Clinical Practice 2014; 105(2): 141-150.
5. Liu S, Guo Q, Han H, Cui P, Liu X, Miao L, Zou H and Sun G: Clinicopathological characteristics of non-diabetic renal disease in patients with type 2 diabetes mellitus in a northeastern Chinese medical center: a retrospective analysis of 273 cases. International urology and nephrology 2016; 48 (10): 1691-8.
6. Zinman B, Wanner C, Lachin JM, Fitchett, D, Bluhmki E, Hantel S, Mattheus M, Devins T, Johansen OE, Woerle HJ, Broedl UC and Inzucchi SE: Empagliflozin, Cardiovascular Outcomes, and Mortality in Type 2 Diabetes. New England Journal of Medicine 2015; 373(22): 2117-2128.
7. Bahmani M, Zargaran A, Rafieian-Kopaei M and Saki K: Ethnobotanical study of medicinal plants used in the management of diabetes mellitus in the Urmia, Northwest Iran. Asian Pacific journal of tropical medicine 2014; 7: S348-S354.
8. Ayyanar M and Subash-Babu P: *Syzygium cumini* L. Skeels: A review of its phytochemical constituents and traditional uses. Asian Pacific journal of tropical biomedicine 2012; 23(7): 857-61.
9. Gochman N and Schmitz JM: Application of a new peroxide indicator reaction to the specific, automated determination of glucose with glucose oxidase. Clinical Chemistry 1972; 18(9): 943-950.
10. Barham D and Trinder P: An improved colour reagent for the determination of blood glucose by the oxidase system. Analyst 1972; 97(1151): 142-145.
11. Lopes-Virella M, Stone P and Colwell J: Serum high density lipoprotein in diabetic patients. Diabetologia 1977; 13(4): 285-291.
12. Friedewald WT, Levy RI and Fredrickson DS: Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. Clinical chemistry 1972; 18 (6): 499-502.
13. Luvuno M, Mbongwa HP and Khathi A: The effects of syzygium aromaticum - derived triterpenes on gastrointestinal ghrelin expression in streptozotocin-induced diabetic rats. African journal of traditional, complementary, and alternative medicines: AJTCAM 2016; 13(4): 8-14.
14. Chandran R, Parimelazhagan T, Shanmugam S and Thankarajan S: Antidiabetic activity of *Syzygium calophyllifolium* in Streptozotocin - Nicotinamide induced Type-2 diabetic rats. Biomedicine and pharmacotherapy = Biomedecine and pharmacotherapie 2016; 82: 547-54.
15. Schoenfelder T, Warmlin CZ, Manfredini MS, Pavei LL, Réus JV, Tristão TC, Fernandes MS and Costa-Campos L: Hypoglycemic and hypolipidemic effect of leaves from *Syzygium cumini* (L.) Skeels, Myrtaceae in diabetic rats. Revista Brasileira de Farmacognosia 2010; 20(2): 222-27.
16. Chagas VT, França LM, Malik S and de Andrade Paes AM: *Syzygium cumini* (L.) skeels: A prominent source of bioactive molecules against cardiometabolic diseases. Frontiers in pharmacology 2015; 6.

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