

# Effects of Bay Leaves on Blood Glucose and Lipid Profiles on the Patients with Type 1 Diabetes

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**Abstract**—Bay leaves have been shown to improve insulin function *in vitro* but the effects on people have not been determined. The objective of this study was to determine if bay leaves may be important in the prevention and/or alleviation of type 1 diabetes. **Methods:** Fifty five people with type 1 diabetes were divided into two groups, 45 given capsules containing 3 g of bay leaves per day for 30 days and 10 given a placebo capsules. **Results** All the patients consumed bay leaves shows reduced serum glucose with significant decreases 27% after 30 d. Total cholesterol decreased, 21 %, after 30 days with larger decreases in low density lipoprotein (LDL) 24%. High density lipoprotein (HDL) increased 20% and Triglycerides also decreased 26%. There were no significant changes in the placebo group. **Conclusion**, this study demonstrates that consumption of bay leaves, 3 g/d for 30 days, decreases risk factors for diabetes and cardiovascular diseases and suggests that bay leaves may be beneficial for people with type 1 diabetes.

**Keywords**—bay leave, cholesterol, diabetes, triglycerides

## I. INTRODUCTION

DIABETES is a chronic disorder of glucose metabolism resulting from dysfunction of pancreatic beta cells and insulin resistance. The incidence of cardiovascular diseases is increased two- to four-fold in people with diabetes [1]. Spices that have been reported to be hypoglycemic include fenugreek, garlic, turmeric, cumin, ginger, mustard, curry and coriander [2]. We have also shown that spices such as cinnamon, cloves, bay leaves, and turmeric display insulin-enhancing activity *in vitro* [3]. Botanical products can improve glucose metabolism and the overall condition of individuals with diabetes not only by hypoglycemic effects but also by improving lipid metabolism, antioxidant status, and capillary function [4].

The composition of human diet plays an important role in the anagement of lipid and lipoprotein concentrations in the blood. The importance of serum lipoprotein disturbances and abnormal lipid metabolism characterized by hyperlipidaemia or hyperlipoproteinemia as etiological factors in the development of coronary heart diseases and potentiating of arteriosclerosis is now supported by a considerable body of evidence amassed from epidemiological and population

studies [5][6][7][8]. Moreover, many studies have now shown that elevated concentration of total or Low density lipoprotein (LDL) cholesterol in the blood are powerful risk factors for coronary heart disease, whereas high concentrations of high density lipoprotein (HDL) cholesterol or a low LDL (or total) to HDL cholesterol ratio may protect against coronary heart disease [9][10]. The use of herbs as medicines has played an important role in nearly every culture on earth, including Asia, Africa, Europe and the Americas [11]. Herbal medicine is based on the premise that plants contain natural substances that can promote health and alleviate illness. Bay leaf, *Laurus nobilis*, belongs to the family *Lauraceae*, and it is one of the most popular culinary spices in Western countries. Bay leaf has been used as herbal medicine and has pharmacological activity which includes antibacterial, antifungal, antidiabetes and antiinflammatory effects [12].

## II. DATA COLLECTION

This study design and utilized to show the impact of bay leave supplementation on blood glucose and lipids levels among type1 diabetic. Then comparison between two results to improved the effects of bay leave on blood glucose and lipids levels. The study was conducted in Al Mafraq Governmental Hospital in Jordan. Fifty five individuals with type1 diabetes of both sexes (30 males and 25 females) of age 40 years or older were recruited for participating in the current study. Only those diabetic subjects, who were not taking medicine for other health conditions and whose fasting blood glucose were in the range of 160- 300mg/dl, and high lipids level were included in the study. The study was approved by Medical Ethical Committee of the Zarqa Private University. The study was conducted for 4 weeks. Type 1 diabetic individuals were allowed to take their routine diet and usual diabetic medicine. The individuals were told to take 2 capsules of whole bay leave powder immediate after breakfast, lunch and dinner for 4 weeks each capsules contain (500mg) that means 3g per day, these capsules were prepared by technician of the local pharmacy. The research did not suggest any alterations in other aspects of the subject's medical care, diet, or exercise. Compliance was monitored by contact with the subjects.

## III. BIOCHEMICAL ANALYSIS

Biochemical analysis done by collection of blood samples approximately 6ml blood samples were taken before breakfast

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from the vein directly into lithium heparin vacuum tubes for measurements of fasting blood glucose level, triglyceride, total cholesterol, LDL and HDL. The samples were centrifuged within 1 hour at 1000xg for 10 min at 4°C, the plasma transferred into separate labeled tubes and transferred immediately by cold boxes filled with ice to the Alquds private laboratory. All biochemical measurements were carried out by the same team of laboratory technicians using an auto analyzer (IMMULIT, DPC, Los Angeles, CA, USA) each individual on the starting day and at end of week 4. Prior to implementation of the training program, an official permission was obtained from the supervisors of the selected units. This was intended to facilitate data collection and to explain study purpose. At the beginning of the study, participants' were invited to participate in the study. The researcher explained the study purpose and procedures for the randomly selected sample. Potential subjects were further informed that the participation was voluntary and that study findings would be presented group wise and no individual would be recognized.

#### IV. STATISTICAL ANALYSIS

Collected data were tabulated and needed statistical analyses were done using descriptive statistic, means, and standard deviation (SD) of the means were calculated utilizing the computer data processing (SPSS, version 12). A probability value (P) of <0.05 was considered to be statistically significant.

#### V. RESULT

Fifty five subjects of type1 diabetes were randomized into the study their The samples had a mean age of 46 years (SD  $\pm 6$ ). Thirty patients were male and 25 female. The majority were married, The mean length of time since diabetes was diagnosed was 10 years (SD  $\pm 7$ ). Repeated measure ANOVA was used to assess the effectiveness of bay leave among type1 diabetic individuals by examining fasting blood glucose and lipid levels changes across time is shown in table1. The fasting blood glucose and lipids values on the starting day indicate of diabetic individuals before the start of bay leave. So these values levels were the control for the study. Bay leaves reduced, total cholesterol, LDL, triglycerides and glucose, and increased HDL levels in people with type 1 diabetes. Additional studies are needed to confirm these results and also to identify the active components. (P<0.05) On the starting day of the experiment (day 0), the mean fasting blood glucose levels of the diabetic individuals, were (201.5 mg/dl), Triglyceride (215.5mg/dl), Total Cholesterol (282 mg/dl), LDL (155.7 mg/dl) and HDL (35.2 mg/dl). When the diabetic individuals used the doses of bay leave (3g) for 4 weeks, their mean Fasting Blood Glucose levels dropped to (136.2 mg/dl), Triglyceride (161 mg/dl), Total Cholesterol (225 mg/dl), LDL (118.5 mg/dl) and HDL (44.5 mg/dl) . The reduction in the mean Fasting Blood Glucose levels and lipid levels were significant at (P<0.05) .

Table II Shows no significant changes in the placebo group. This conclusion was supported by the repeated measure ANOVA (F) test.

TABLE I  
LEVELS OF FASTIN BLOOD GLUCOSE AND LIPID PROFILES  
BEFORE AND AFTER CONSUMPTION OF BAY LEAVES ON TYPE 1  
DIABETIC

Test	Starting day	After 4 weeks	% of reduction
	Mean $\pm$ SD(mg/dl)	Mean $\pm$ SD(mg/dl)	
(FBG)	201.5 $\pm$ 36.70	136.2 $\pm$ 3.1	27%
Triglyceride	215.5 $\pm$ 20.65	161 $\pm$ 5.1	26%
Cholesterol	282 $\pm$ 30.20	225 $\pm$ 7.3	21%
LDL	155.7 $\pm$ 22.30	118.5 $\pm$ 5.1	24%
HDL	35.2 $\pm$ 5.1	44.5 $\pm$ 4.2	Increase 20%

TABLE II  
EFFECT OF PLACEBO ON FASTING BLOOD GLUCOSE AND LIPID  
PROFILES OF THE TYPE 1 DIABETIC

Test	Starting day	After 4 weeks
	Mean $\pm$ SD(mg/dl)	Mean $\pm$ SD(mg/dl)
(FBG)	201.5 $\pm$ 36.70	136.2 $\pm$ 3.1
Triglyceride	215.5 $\pm$ 20.65	161 $\pm$ 5.1
Cholesterol	282 $\pm$ 30.20	225 $\pm$ 7.3
LDL	155.7 $\pm$ 22.30	118.5 $\pm$ 5.1
HDL	35.2 $\pm$ 5.1	44.5 $\pm$ 4.2

#### VI. DISCUSSION

The present study shows that 4 weeks of bay leaves supplementation does improve plasma glucose and lipid profiles in patients with type 1 diabetes. The active components of bay leaves are under study. Of the 81 compounds representing 98.74% of total oil of *Laurus nobilis*, monocyclic monoterpenes such as 1,8-cineole (58.59%), alpha-terpinyl acetate (8.82%), and terpinene-4-ol (4.25%) are the main components. Bicyclic monoterpenes such as alpha- and beta-pinene (3.39–3.25%) and sabinene (3.32%) are also present. The acyclic monoterpenes, linalool, myrcenol, and sesquiterpenes are found at less than 0.5%. o-Cymene (1.30%) and p-cymene (1.83%) are also present, and cuminaldehyde, dimethylstyrene, eugenol, methyl eugenol, and carvacrol are minor, aromatic compounds of laurel oil [13]. The active *in vitro* component of bay leaves is water soluble [41]. The active component of the bay leaves is likely a polyphenol since more than 80% of the *in vitro* insulin potentiating activity was removed by polyvinylpyrrolidone, which binds aromatic hydroxyl groups [15]. The current study indicate that

present of Polyphenols compound in bay leaves have been shown to have effects on insulin sensitivity, glucose uptake and antioxidant status, these findings agree with Anderson *et al.* [16]. Also a variety of phenolic compounds, in addition to flavonoids, are found in fruit, vegetables and many herbs. The phenolic compounds (such as caffeic, ellagic, and ferulic acids, sesamol, and vanillin) inhibit atherosclerosis [17]. The present study shows reduction in triglyceride, total cholesterol and LDL related to phenolic compounds supported by Nofer *et al.*, [18] documented that the role in reverse cholesterol transport, HDL have recently been recognized to have several other important cardioprotective properties including the ability to protect LDL from oxidative modification. Also, Parthasarathy *et al.* [19] suggested that HDL may play a protective role in atherogenesis by preventing the generation of an oxidatively modified LDL and the mechanism of action of HDL may involve exchange of lipid peroxidation products between the lipoproteins. HDL is the major carrier of cholesteryl ester hydroperoxides, but more than this it appears to have the prolonged capacity to decrease the total amount of lipid peroxides generated on LDL during oxidation.

Several enzymes are present on HDL: paraoxonase (an enzyme normally resident on HDL), lecithin, Cholesterol acyl transferase, platelet activating factor acetylhydrolase, phospholipase D and protease. Apolipoproteins, such as apolipoprotein AI, could also have enzymic activity [20]. The current study shows increasing in HDL after consumption of bay leaves for 30 days supported by Mackness *et al.* [21] suggested that a direct role for HDL in preventing atherosclerosis probably by an enzymic process which prevents the accumulation of lipid peroxides on LDL. They reported that paraoxonase is an example of an enzyme which might possibly be involved. Oxidative stress is particularly active in brain whose membranes are rich in polyunsaturated, highly peroxidizable fatty acids. The antioxidant efficiency of bay leaf and the extent of oxidative damage in diabetic rat brain synaptosomes. The diabetic rat brain is defective in neurotransmission that is attributable to oxidative damage [22]. This prompted the present study. The total polyphenolic content of bay leaves was found to be 6.7mg gallic acid equivalents (GAE)/100g. Bay leaf displayed scavenging activity against superoxide and hydroxyl radicals in a concentration-dependent manner. Further, bay leaves showed inhibition of Fe<sup>2+</sup>-ascorbate induced lipid peroxidation in both control and diabetic rat [23].

The increased level of cholesterol in the diabetic rat brain synaptosomes could arise from a rise in cholesterol biosynthesis. Increased activity of hydroxy methyl glutaryl (HMG CoA) reductase, a rate-limiting enzyme in cholesterol biosynthesis has been reported in diabetic rats [24]. Bay leaf contains linalool as the active component, which may effectively scavenge the free radicals and terminate the radical chain reaction. Linalool has considerable protective effects against H<sub>2</sub>O<sub>2</sub> induced-oxidative stress in brain tissues by decreasing oxidative reaction in unsaturated fatty acids [25].

## VII. CONCLUSION

Bay leaves reduced, total cholesterol, LDL, triglycerides and glucose, and increased HDL levels in people with type 1 diabetes. Additional studies are needed to confirm these results and also to identify the active components.

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