



Original Article

Evaluating the Anti-Diabetic Effect of Ginger Powder in Experimental Rats

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ABSTRACT

Objective: In the current research paper, the effect of ginger powder on diabetic rats was probed. **Methods:** The bio-adequacy study was observed on Alloxan prompted Wistar rodents by taking ginger powder at three levels for example 1%, 3% and 5% ginger powder for a time of about a month. There were 4 gatherings (one was control and the other three getting various rates of ginger powder), each containing 5 rodents. The blood tests were gathered at multi day, fifteenth day and 28th day. Glucose and insulin levels were estimated. The information in this manner acquired was genuinely investigated to discover the degree of importance. **Results:** Results showed that glucose levels essentially diminished alongside critical expansion in insulin levels. This examination configuration infers that ginger powder has constructive outcomes in bringing down glucose levels. Subsequently, use of ginger powder and ginger tea ought to be expanded in diabetic patients to diminish hyperglycemia in diabetic patients and defeat from high BSL levels in pre-diabetics. The conclusive results of this study were that ginger powder effected and show anti-diabetic effects as mean values of glucose levels dropped from 362.35±25.61 to 117.94±10.96. Proximate analysis showed that ginger powder contains ash, moisture, crude fat, crude fiber and crude protein content as 6.5% ± 0.31, 19.9% ± 1.50, 12.6% ± 0.50, 5.2% ± 0.11, 9.9% ± 0.34 respectively. Moreover, in liver functions, ALP, ALT, AST were examined resulting as a drop in mean values from 154.20±11.86 to 153.89±11.53, from 51.93±4.32 to 50.68±4.15 and from 106.77±12.85 to 110.26±11.54 respectively **Conclusions:** Thus, Ginger should be launched in parameters of community nutrition based research programs in order to overcome diligence that is becoming a physiological health threat and furthermore, Ginger should be enhanced in the usage of foods which are used for the purpose of salad dressing because it needs its promotion in the areas of weight reduction plans and controlling diabetes mellitus in body physiology.

INTRODUCTION

Ginger (*Zingiber officinale*, Roscoe Zingiberaceae) is known for the most part devoured flavors broadly globally. It was started in Southeast Asia and is currently spread to Europe. Ginger has extraordinary long history of a valuable home-grown medication which benefits in treating an assortment of afflictions that incorporates retching, agony, acid reflux, and cold-initiated influenza and fever. All the more as of late, it was inferred that ginger likewise has hostile to coagulating, against malignant growth, mitigating, and other pain-relieving exercises. Henceforth, fundamentally accentuation on the impacts of ginger in administration of metabolic sicknesses and different

confusions connected with Diabetes mellitus (DM) are seen [2,3]. Diabetic patients are perceived as having constant high glucose level which results from debilitated insulin levels in blood or impeded discharge of insulin. It has two significant sorts, first is Type 1 and the other one is Type 2. DM Type 2 is major mindful reason for >90% of diabetes. It has impacted 6.4% of individuals of grown-up bunch all over the planet in 2010. . Insulin is a secretion which is secreted by the beta cells of islets of langerhans. It's an enzymatic secretion responsible to maintain homeostasis level of glucose in blood. According to a research, it was observed that ginger powder was actually very effective in

curing blood sugar level as glucose levels depleted after treatment phase. Glucose levels were significantly dropped and the obtained mean after treatment phase is 86.17 ± 8.25 mg/dl [14].

METHODS

Ginger was procured from Local market, Lahore, then packed in sealed bag to avoid any further contamination until further analysis at laboratory facility of Food department at University of Lahore. After removing physical contaminants like dirt, dust and foreign particles, washing with clean water, peeling and slicing, ginger was dried at 200°C for 10 minutes in hot air oven. After drying, it was grounded into fine powder by using commercial blender. Ginger powder was packed in sealed bag to avoid any further contamination until further analysis at laboratory facility of Food department at The University of Lahore. Ginger powder was analyzed for their chemical composition. Moisture, ash, crude protein, crude fat and crude fiber was quantified according to their relevant procedures. The nitrogen-free extract (NFE) was calculated by difference method [4]. A sample were collected from ginger powder was analyzed for their moisture contents by using hot air oven at a temperature of 105°C for 24 hr according to the method No. 44-15A [4]. Ash content in ginger powder was calculated by muffle furnace by following method No. 08-01 [5]. Protein content in ginger powder samples was determined by Kjeldahl's method as described in the method No 46-10 [6]. The fat content has been observed and sample is taken for the determination of fat content. The instrument used was Soxhlet apparatus according to method No. 30-25 [7]. Ginger powder was taken for crude fiber analysis by adopting the procedure mentioned in Method No. 32- 10 [8]. The nitrogen-free extract (NFE) was calculated by subtracting the percentages of moisture, crude protein, crude fat, crude fibre, total ash from 100. The study design was Randomized Controlled Trial. All the 20 rats included in the study were given three different levels of ginger powder as detailed in Table 1 showing diet composition. 5 rats of Group I were not given any special diet but were fed on commercial basal feed. The rats were made diabetic by injecting alloxan mixed with 1ml distilled water intraperitoneally at the rate of 65mg/kg of body weight before the start of the experiment. After 7th day of the injection the rats were diabetic for the research purpose [9]. On 8th day which was considered day 0 of the study, the blood samples (1 ml) of the rats were taken. It was then centrifuged at 30000 rpm and serums were stored in refrigerator at 4°C until further analyzed [10]. During the 4 weeks of bio-efficacy study a specified diet considering as 1% Ginger Powder, 3% Ginger Powder, 5% Ginger Powder were given to Group II, Group III,

Group IV respectively throughout the experimental period as mentioned in table 1. The feed and water were given adlib. The rats were kept in standard cages and water was given by bottles. The ginger powder was mixed in diets of three experimental groups very carefully. The diets consumed by the rats of all groups were calculated on weekly basis including controlled group. A blood sample of 1 ml from each rat of four groups was collected from azygos vein at 15th and 30th day. The serum was stored as explained above. Table 2 shows that the composition of diet of four groups of rats is given in Table 2. In each group, glucose concentration was estimated by GOD-PAP method as described by [12]. Insulin level was estimated by following the instructions of [13]. In order to assess the safety of ginger powder, following tests was performed. The data thus obtained is subjected to statistical analysis by using Analysis of variance (ANOVA) in SPSS (Andy Field SPSS) to find out the effect of different percentages of ginger powder on diabetic rats.

RESULTS

The proximate analysis of ginger powder is shown in the Table 3. It shows that moisture content of ginger powder is $19.9\% \pm 1.5$, whereas crude fat is $12.6\% \pm 0.50$, crude protein is $9.9\% \pm 0.34$, ash content is $6.5\% \pm 0.31$ and crude fiber is $5.2\% \pm 0.11$ (Table 3). The present study concludes the results in accordance of conclusions of Nwinuka et al., (2005)s reports that identifies moisture content of ginger powder was $57.6\% \pm 1.9$, whereas crude fat was $12.9\% \pm 0.55$, crude protein was $8.48\% \pm 0.29$, ash content was $6.6\% \pm 0.34$ and crude fiber was $6.8\% \pm 0.11$. Similar results were reported by Ugwoke et al. (2010). They mentioned that ginger powder has $16.5\% \pm 1.8$ moisture, $12.6\% \pm 0.57$ crude fat, $8.42\% \pm 0.30$ crude protein, $6.4\% \pm 0.31$ ash and $7.1\% \pm 0.12$ crude fiber. The values of mean of glucose levels of control and treatment groups are given in table 4. The values recorded for blood glucose level in wistar rats for controlled group was 369.82 ± 28.02 at zero days. It was then significantly decreased to 117.94 ± 10.96 at the end of the study (Table 4). Respectively in group 4 in which 5% ginger powder feed was given significant changes occurred in this research. Table 4 and 5 shows the group which has received the highest amount of ginger powder (G4) has shown maximum reduction in mean glucose levels of 191.19 ± 16.38 (Table 4). The mean square for days in table 1 shows 167435 days wise. Hence table 4 shows results for ginger powder treatment on glucose of wistar rats. It was found that all the values for treatment, days and treatment into days were significant. The Table 5 shows descriptive analysis of ginger powder treatments on insulin. The values of mean for insulin levels of control and treatment groups are given in Table 5. The value of insulin for control group was

recorded as 0.0550 ± 0.01 at day zero and it was decreased significantly during the present research work. The group which received highest percentage of ginger powder i.e. 5% showed maximum reduction for the insulin levels.

Groups	Name	Diets
Group I	Control	Normal diet1
Group II	GP 1	% Ginger Powder
Group III	GP 3	3% Ginger Powder
Group IV	GP 5	5% Ginger Powder

Table 1: Groups for Bio-Efficacy Study

Ingredients (%)	Control	GP 1	GP 3	GP 5
Ginger Powder	-	1%	3%	5%
Canola oil	15	15	15	15
Corn Starch	50	50	50	50
Casein	20	20	20	20
Cellulose	10	9	7	5
Salt Mixture	4	4	4	4
Vitamins	1	1	1	1
Total	100%	100%	100%	100%

Table 2: Diet composition of Four Rat Groups

Control = Rats taking basal diet, GP 1 = Rats taking basal diet + 1% Ginger Powder

GP 3 = Rats taking basal diet + 3% Ginger Powder, GP 5 = Rats taking basal diet + 5% Ginger Powder.

Parameter	Percentages \pm SD
Ash	$6.5\% \pm 0.31$
Moisture	$19.9\% \pm 1.50$
Crude Fat	$12.6\% \pm 0.50$
Crude Fiber	$5.2\% \pm 0.11$
Crude Protein	$9.9\% \pm 0.34$

Table 3: Proximate analysis of ginger

Days	Treatments				Means
	GP 1	GP 2	GP 3	Gp 4	
0 Days					
	369.82 ± 28.02^a	354.87 ± 27.06^{ab}	345.93 ± 29.87^b	362.35 ± 25.61^{bc}	358.24 ± 27.64^d
28 Day	384.75 ± 30.87^a	133.26 ± 12.67^b	128.83 ± 11.04^c	117.94 ± 10.96^d	191.19 ± 16.38^e
Means	377.29 ± 29.45^a	244.06 ± 19.87^b	237.38 ± 20.45^c	240.14 ± 18.29^d	

Table 4: Mean Squares for Glucose

Days

Days	Treatments				Means
	GP 1	GP 2	GP 3	Gp 4	
0 Days					
	0.0621 ± 0.01^a	0.0579 ± 0.01^a	0.0649 ± 0.01^a	0.0872 ± 0.01^a	0.0550 ± 0.01^a
28 Day	0.0862 ± 0.01^a	0.0931 ± 0.01^b	0.1066 ± 0.01^b	0.0600 ± 0.01^b	0.0631 ± 0.01^b
Means	0.0742 ± 0.01^b	0.0755 ± 0.01^b	0.0857 ± 0.01^b		

Table 5: Mean Square for Insulin

DISCUSSION

It was found that all the values for treatment, days and treatment into days were non-significant. Similar findings were suggested by Rong et al., (2009) and El-Kott et al., (2010) [15,16]. Conclusion of a study recommends that for

shorter time span when ginger supplementation was given for 8 weeks in the subjects which were suffering with DM significant results were found and insulin levels were increased. The insulin determined after ginger supplementation treatment insulin levels recorded were (mU/ml) 12.7 ± 2.9 [17,18]. The descriptive analysis of ginger powder treatments on insulin. The mean treatment for day 0 was 0.0872 ± 0.01 , whereas, it was 0.0600 ± 0.01 for day 28 (Table 5). A study performed by some scientists had almost similar results of mean when compared with this current study. It was concluded that Alkaline Phosphatase (ALP) was 99.62 ± 2.51 U/mL. In controlled group recorded values which were elevated were 458.48 ± 23.65 U/mL. When treated with ginger powder, the levels of ALP were reduced 26.78 ± 2.51 U/L. In another study ALP values diagnosed for T0, T1 and T2 were 154.83 ± 5.26 , 152.61 ± 5.19 and 151.46 ± 5.15 IU/L respectively and after the treatment phase i.e. treatment was given with ginger powder in T0 value elevated (158.19 ± 5.06 IU/L) and then reduced in T1 at (155.30 ± 4.97 IU/L) and in T2 it was (153.27 ± 4.90 IU/L). In another research non-significant results were diagnosed and mean value was (218.13 ± 8.67 IU/L) [2]. Alanine transaminase (ALT) is also responsible for determining mobile necrosis of liver, when cholesterolosis mechanism is over [19]. The determination of variance regarding the effect of ginger powder on the ALT of diabetic rats. The identification of conclusion gives us prediction that the levels of ginger powder with different percentages significantly affected the plasma ALT levels as well as the effect of days was also significant. The correspondence of treatment and days has also recorded as significant in ALT parameter. The mean values for plasma ALT levels of control and treatment groups. The recorded value for ALT of controlled group is 51.70 ± 4.03 at the zero day, it was decreased significantly to 50.78 ± 3.08 at the end of this study. Similarly, in the groups of treatment the recorded value of ALT decreased significantly in this research. The group which received the highest level of percentage of ginger powder i.e. (5%) has showed maximum reduction in plasma ALP levels of 51.89 ± 4.18 . In a study means of ALT were recorded as 51.68 ± 1.76 , 50.26 ± 1.71 and 49.84 ± 1.69 IU/L for the groups of T0, T1, T2 respectively when ginger powder was given to them. Another study occurred and according to that means recorded after treatment were 52.37 ± 1.68 , 51.72 ± 1.66 and 50.63 ± 1.62 IU/L. Diagnosis of ALT in Study III after treatment strategy was almost same as this research i.e. ALT levels decreased significantly to 52.99 ± 1.59 IU/L in T1 and 51.69 ± 1.55 IU/L. A research explained that when subject was treated with ginger powder ALT levels from (50.38 ± 1.81 IU/L) dropped to (49.10 ± 1.77 IU/L). The descriptive analysis of ginger powder treatments on ALT. The mean treatment for day 0 was

51.93±4.32 whereas it was 50.68±4.15 for day 28. Aspartate Aminotransferase (AST) is that enzyme of body which is usually present in the heart cells and liver cells. Glutamic Oxaloacetic Transaminase (SGOT) is another name for AST. There are some medications in market which are sometimes responsible for raising the levels of AST in body [20]. Variance analyzed for the effect of ginger powder on AST of diabetic rats. The mentioned outcome by feeding different amounts of ginger powder non significantly affected the plasma AST levels and the effect of days was also non-significant. The treatment with day's interaction was also non-significant in this parameter of AST. The mean values for plasma AST levels of treatment and controlled groups of powder of ginger. Determination of results show that the different levels of ginger powder when feeded to wistar rats show significant effect on the plasma AST levels of them. Variance analysis as an effect of ginger powder on the AST levels of alloxan induced ginger powder. The values of mean and standard deviation for plasma AST levels of control and treatment groups. The value of AST for control group recorded in this research was 106.77±12.85 at day zero and it was then decreased non-significantly to 110.26±11.54 at the end of study. Group 3 which received 3% ginger powder showed maximum reduction in plasma. The mean treatment for day 0 was 106.77±12.85 whereas it was 107.73±12.54 for day 28. which was 99.62±2.51 U/mL after treatment with ginger powder became 94.77±3.14 U/mL [21].

CONCLUSIONS

The conclusion regarding this parameter showed that feeding different levels of ginger powder non-significantly affected the plasma levels as well as the effect of days was also non-significant.

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