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Effect of an oat extract on oxidizing Stress and antioxidant defense in male rats with type 1 diabetes

Haidar Alsaedi*[1], Reem abdul Raheem Mirdan alsaad[2], Huda Raheem Hashim[3]

[1]Department of Basic Science, Faculty of Dentistry, Al-Qadisyah University, Iraq
[2]Department of anatomy and histology -College of medicine –university of Babylon, Iraq
[3]College of Basic Education - University of Al Muthanna, Iraq

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ABSTRACT

The strong n-butanol extract of oats (Avena sativa) seed was studied in streptozotocin-induced diabetic rats to improve lipid peroxidation and inhibitor standing. Four teams, NDM, and three diabetic teams were allocated thirty-two male rats. Diabetes was caused by injection- streptozotocin (60 mg / kg B.w., i.p. Two hundred mg/deal of blood sugar rodents was used as a diabetic. Diabetes groups (G2, G3, and G4) were trained to extract n-butanol (60 mg / metric unit weight, B.w.) or twenty-one days of endocrine injection (4 IU / animal). Weight gain was reported on the 22nd day. Fluids were collected for knockout cells to judge glucose concentrations and subcellular of aminotransferase, aspartate transaminase, catalase, biochemical dismutase (SOD), glutathione - transferase, reductase, malondialdehyde and glutathione reductase (Gr) concentrations. Diabetes rat (G2) showed a significant increase in glucose. The weight gain increased in the ALT, SOD, CAT, GSH-transferase But there decreased GSH enzyme and old AST. Treatment of N-butanol extract from oats (G3) or endocrine (G4) varied between old glucose, weight gain and normalization of all supermolecule inhibitors. Finally, n- Butanol from oatmeal has a strong role in lowering hyperglycemia and as an antioxidant

*Corresponding Author

Name: Haidar Alsaedi
Phone: +964731155878
Email: Haider.k.abaas@gmail.com

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INTRODUCTION

Diabetes mellitus is metabolic disorders with booming prevalence worldwide, caused by insufficient insulin secretion or decreased sensitivity to insulin in peripheral tissues. According to the data of International Diabetes Federation (IDF) (Zhou *et al.*, 2019), about 425 million adults in the world have diabetes in 2017, and the diabetic population is expected to reach 693 million people by 2045. In addition, the prevalence of impaired glucose tolerance (IGT) among adults aged 20–79 in 2017 was 7.3%, and it is expected to reach 8.3% by 2045. Four million people died of diabetes and its complications in 2017, accounting for 10.7% of the total worldwide deaths. Diabetic patients suffering from various symptoms, such as increased urine output, thirst, weight loss, and weakness can't have a normal quality of life like others (Masrar, 2018). On the other hand, in 2017, the healthcare expenditure of diabetes and its complications around the world was hundreds of billions of dollars. It can be seen that diabetes not only seriously endangers human health but also brings a heavy financial burden to individuals, families and society. Hypoglycemia and prevention of diabetes and complications have become the focus of scientific research. In many factors that

influence the development of diabetes, nutritional treatments, compared with factors such as genetics, can be modified and proved effective (Grosso, 2018). Many studies have shown that Mol oats, as recommended whole grains, have remarkable hypoglycemic effects (Wang, 2019). In 2014, Bao and others came to a conclusion by 15 randomized controlled studies (from the US, Canada and Europe) that compared with foods such as wheat, daily intake of more than 3 mg oat β-glucan (equivalent to more than 60 g oats) for more than eight weeks can significantly reduce fasting insulin, blood glucose and glycosylated hemoglobin levels (Wang *et al.*, 2019). This shows that other components in oats may play an important role in blood glucose regulation. In recent years, it has been found that bioactive peptides have many remarkable physiological functions and activities (Mir *et al.*, 2018). Compared with proteins, bioactive peptides have simpler structures, higher stability, and lower or no immunogenicity. Domestic and foreign scholars have isolated numerous peptides with hypoglycemic function from natural plants and animals (Masrar, 2018). The protein content in oats is 10–20% (Guan, 2018), which is about twice that of rice, wheat and cornmeal. Oat protein contains 18 kinds of amino acids, and the essential amino acid composition is relatively balanced and comprehensive. For example, lysine is as high as 0.75 g/100 g, which is inferior to other grain crops (Grosso, 2018). Therefore, oat protein is considered to be a better grain protein (Bensalah *et al.*, 2018), and also a raw material for preparing high-quality OOPs. At present, however, there is little research on the effect of oat oligopeptides on blood glucose. Meanwhile, there is no study on micturition frequency measurement in diabetic rats as yet. This study will also focus on micturition frequency changes in diabetic rats with OOPs intervention.

METHODOLOGY

Experimental animal

Mature male rats Sprague-Dawley. Before the experiment began, male rats were allowed to adapt for a week to the atmosphere of the animal house. Animals ate the quality chow during the experiment and drank spontaneously.

Preparation of n-butanol

Ministry of Agriculture, Iraq (SBSTC) bought oats (Avena sativa) from the local market (Harborne, 1984). According to Soxhlet's equipment, a butane flavor extract was prepared from the methanol extract. Use one weight unit of flavor, extract methanol. Stored in a dry electric refrigerator (40 $^{\circ}$ C and 50 to 60 rpm). The dried extract was extracted, and deep freezing was maintained (Guan, 2018).

Induction of diabetes in rats

Twenty-four Sprague Dawley rats by 230 to 250 g (60 days) were used to induce diabetes by used Streptozotocin (Mansford and Opie, 1968). The animals were injected with STZ (60 mg/kg b.w., i.p.).

The design of Experimental

Non-diabetic eight male rat and twenty-four STZ rats in each direction were identified to four equal treated for 4 weeks as follows\ Non-diabetic (G1) necative: Drilled daily with controlled eating only;Diabetes group(G2) positive: drilled daily with controlled eating only; Diabetic group with N-treated butanol (G3): drilled daily with drinking water (60 mg / kg bw) containing extract n - Butanol from oats ; Diabetic group with insulin (G4) ingested: Drinked daily with drinking water and injected with a single dose of insulin (4 IU / rat).

Subcellular fluid

Immerse water in liver tissue until there is a purple color. Tissue was homogenized by 20 strokes up and down during the bottom glass mill (Ayako and Fridovich, 2002).

Evaluation of ALT and AST activity

Assessment of quantitative chemical analysis methodology was conducted by victimization (Reitman and Frankel, 1957).

Evaluation of total GSH activity

The decreased chromagen absorbance concentration of GSH (Burtis and Ashwood, 1999).

Evaluation of enzyme (SOD) activity in liver subcellular fluid

SOD concentrations were evaluated by victimization (Winterbourn *et al.*, 1975).

Evaluation of enzyme (CAT) activity in liver subcellular fluid

CAT activity was evaluated by measuring according to (Aebi *et al.*, 1974).

Evaluation of macromolecule peroxidation

Perioxidation product concentration malondialdehyde (MDA) accordance with (Carlberg and Mannervik, 1975).

Glutathione reductase activity

This was evaluated using the technique (Carlberg and Mannervik, 1975).

Glutathione-transferase activity

Table 1: Effect of n-butanol of oats (Avena sativa) seed on subcellular_ ALT and AST induced by STZ

Parameter	Group			
	G1	G2	G3	G4
ALT concentration (IU/L)	2 4 .30± 2 .92C	4 1 .62± 3 .77A	3 2 .35± 4 .52B	2 6 .61± 3 .34C
AST concentration (IU/L)	42 .44± 4 .92A	4 0 .55± 4 .38A	4 4 .41±1 2 .94A	1 7 .93± 4 .04B

Numbers are ± SD mean. Superscript letters depict meanings betwee norganizations ($p < 0.05$)

Table 2: Effect extract oats (A vena sativa) on levels of serum _antioxidants in mature male rats induced by STZ

Antioxidant Capacity Parameters	G1	G2	G3	G4
GSH concentration(nmolmMg protein)	890.18±0.56A	750.07±0.66B	810.00±0.94A	802.78±0.70A
MDA (nmol/g tissue)	6.71±0.98c	60.64±0.88a	16.14±0.89b	19.65±1.09b
GST (U/mg Hb protein)	0.5±0.61D	0.77±0.74A	0.45±0.73B	0.43±0.46C
GPx (U/g Hb)	15.27±0.87D	39.26±0.83A	19.4±1.35B	23.61±1.12C
GR (μmol/mg protein)	50.61±0.54A	42.55±1.11B	43.16±0.57B	45.44±0.72B
CAT (U/L tissue)	0.049±0.82B	0.765±0.99A	0.551±1.34B	0.593±0.73B
SOD activity (U/L tissue)	5.702±0.95B	6.099±2.98A	4.941±1.88B	5.940±2.78A

Numbers are ± SD mean. Superscript letters depict meanings between organizations ($p < 0.05$)

The technique of estimating protein (Lowry *et al.*, 1951; Habig *et al.*, 1974).

Statistical analysis

Experiment data were evaluated using one-way variance assessment (SPSS) using F-test (Scheffler, 1979). To value less than 0.05.

RESULTS AND DISCUSSION

Body weight gain

Body weight gain In all groups, the rats body weight at the start of the research was comparable. At the (Figure 1) untreated diabetic rodents had a considerably lower weight gain ($p < 0.05$) (2 7 .5 ± 2 .56 g) compared to rats in other groups (G1: 1 20 .2 ± 2 .63 g; G3: 90 .7 ± 4 .55 g; and G4: 9 7 .9 ± 2 .84 g).

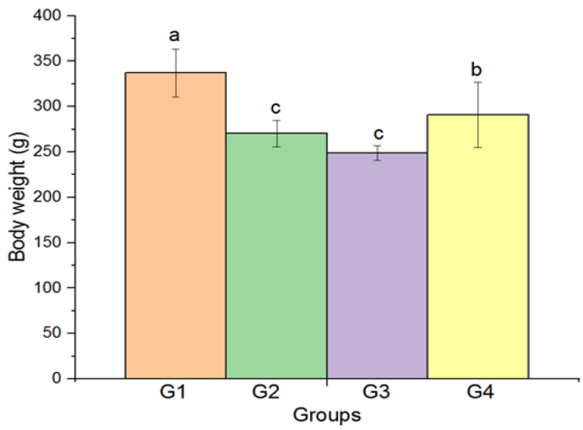

Figure 1: Effect of n-butanol oat extract (Avena sativa) on weight gain (g) indiabetic rats caused by STZ

Blood glucose

At the (Figure 2) no significant differences between groups G3 and G4, but control rats recorded a significant lower level.

Evaluation ALT and AST activity

As in Table 1, the diabetic group showed a significant increase in ALT concentration ($p < 0.05$) and normalized AST concentration in liver tissue, while both enzymes were normalized by n-butanol seed extract fraction and insulin therapy.

Evaluation anti-oxidant activity

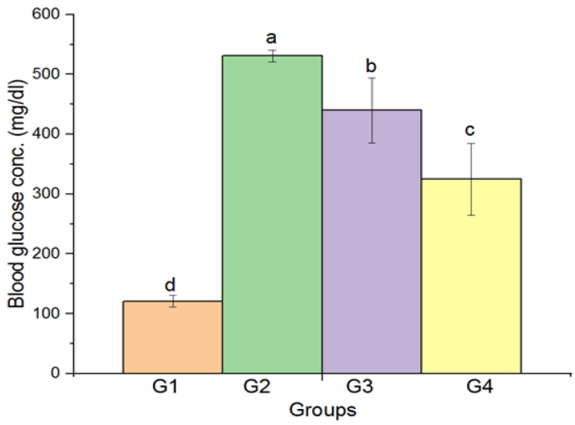

Figure 2: The role of the n-butanol extract of oats (Avenasativa) in the concentration of blood glucose in STZ caused mature rats

Diabetic group showed significantly increased GSH, MDA , SOD ,CAT,Gr and GSH-transferase concentrations ($p < 0.05$) and decreased GSH-reductase activity ($p < 0.05$). All antioxidant enzyme activity was normalized by oat seed N-butanol extract and insulin therapy (Table 2).

The aim of this study was to evaluate the antioxidant activity of Avena sativa seed extract in male rats caused by STZ dose. The use of this compound to cause diabetes (Panhwar and Begum, 2018) and oxidative stress (Junod *et al.*, 1969). since it was discovered that STZ possesses the characteristics of diabetes by destroying beta-pancreatic cells. In the laboratory gaskets. Recent studies have shown that oat seed extract works to lower blood lipids and antioxidants because there is free radicals (Zhang, 2005). The hypoglycemic effect of oat seed extract, which contains antioxidants of phenolic compound in oat seeds (Singh and Handa, 1995) or may suggest high standards of alkaloids and flavonoids in oat seed-butanol extract (Häring and Vinck, 2000). responsible for the effect of oral hypoglycemia included in this paper. It has been suggested that strong lipid peroxide by modified collagen gene expression can be linked between tissue injury and cirrhosis (Poli *et al.*, 1993). Pure oxygen in diabetes due to hyperglycemia, which generates free radicals after auto-oxidation of the disease, oxygen-free radical production was shown by STZ (Ivorra *et al.*, 1989). Types of Diabetes Previous tests was an increase in lipid peroxide in the liver of diabetic and kidney in rats (Hussein, 2012). They were able to strengthen themselves rat treated with STZ subcellular cell concentration in ALT while rats group that treated with n-butanol and insulin reduced the level of the same enzyme. On the other hand (Venkateswaran and Pari, 2002) was discovered oat extract had no side effects, so that weight loss or impaired liver function, as evidenced by subcellular ALT and AST activity. The antioxidant enzymes (SOD, CAT, Gr, GSH-transferase and GSH-reductase) (Wang *et al.*, 2019) and non-enzymatic (GSH) are studied here in the content of subcellular GSH in the liver of rat treated with n-butanol and insulin may be associated with inhibition of lipid fracture of tissues of this organs. GSH plays an important role in the antioxidant cellular system because there is free radicals and other reactive oxygen types of metabolic activity (Zhou, 2004). During diabetes, we observed a significant reduction in GSH liver (G2 group). (Zhou, 2004). Reduced growth hormone levels in the body are associated with increased use due to reactive oxidative stress (Baynes and Thorpe, 1999). GSH concentrations in the liver may reduce antioxidant activity such as GSH as the mainstay of this vital activity (Anuradha and Selvam, 1993). The level of MDA concentration SOD, GR, CAT and GSH-transferase concentration and are determined in rat induced by diabetic STZ in response to oxidative pressure in both lipid peroxide.

The depletion of GSH in the liver reduces the metabolism of antioxidants, such as GSH as a base material for this activity (Winterbourn *et al.*, 1975). The concentration of MDA and the antioxidant protection mechanism imagined by SOD, GR, Cat and GSH-transfer are determined in rat caused by STZ diabetes in response to the oxidative forces in both lipid peroxides. These results were controlled. SOD and CAT activity are main enzymes that contain free radicals from the toxins from it. Previous experiments revealed a low level of diabetes in SOD (Vucic *et al.*, 1997). Absolute oatmeal intake has been active in controlling free radicals where N-butanol is rich in flavonoids that mains, a globally known antioxidant. (Middleton *et al.*, 2000). This free radical scan CAT is an enzyme that converts toxins into hydrogen peroxide in water. The concentration of CAT in malignant species was reduced, and SOD could be improved in n-BF treated rat due to improved GSH ratio restored. This intervention may include cellular metabolic processes. Some studies have identified the relationship between the efficacy of high xanthine oxidase (XOD) and oxygen root formation for diabetes (Masrar, 2018). XOD inhibitors are recognized that reduce oxidative stress in diabetes. XOD inhibitors in clinical practice are known to reduce oxidative stress in diabetes. N-butanol oat seed extract can interact with the active subtypes of Cl3OO, making the activity of XOD, SOD and CAT enzymes. For positive results on flavonoids. N-BF oat seed extract can be extracted with Cl3OO

subtypes, making the activity of XOD, SOD and CAT enzymes. For positive results on flavonoids. In rats treated with thioacetamide in addition to insulin, an effect was observed on the liver of oats (Mir *et al.*, 2018). Inner flavonoids can interfere with metabolism by free radical scavenging or by weakening the microenvironment enzyme necessary for this metabolism at the beginning of the stage of peroxide.

CONCLUSION

It can be concluded that whole oats (Avena sativa) has a positive effect. The effect is beneficial, as an antihyperglysimia and effective Antioxidant agent in the diabetes experience Male rat used for 4 weeks. Further investigation is needed Conducted in order to recommend the use of oats in the clinical features of a different disease or Tough conditions.

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