Protective Effect of Oat and Corn Brans Supplementation Against Fatty Liver in Male Rats

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Abstract

This study aimed to evaluate the potential protective effects of oat bran and corn bran supplementation against fatty liver disease in male rats. The experimental design included six groups: a negative control group fed a standard diet, a positive control group fed a high-fat diet, and four treatment groups fed a high-fat diet supplemented with either 2.5% or 5% oat bran, or 2.5% or 5% corn bran. Biochemical analyses and histopathological examinations were conducted to assess liver and kidney function, lipid profile, and oxidative stress markers. The results revealed a significant deterioration in liver and kidney function, lipid metabolism, and antioxidant biomarkers in the high-fat diet group compared to the negative control. However, supplementation with oat and corn brans—particularly at the 5% level—resulted in notable improvements in biochemical parameters. These included enhanced liver and kidney functions, reduced lipid peroxidation, increased antioxidant activity, and attenuation of histopathological changes in liver tissue. Oat bran and corn bran supplementation demonstrated protective effects against fatty liver in male rats, with oat bran showing slightly greater efficacy at higher doses. These findings support the potential use of oat and corn brans as functional dietary components in the prevention and management of fatty liver disease.

Keywords: oat bran, corn bran, fatty liver, dietary fiber, antioxidant, liver function, rats.

Introduction

Non-alcoholic fatty liver disease (NAFLD) has become one of the most common chronic liver conditions globally, affecting approximately 25% of the world's population. It is strongly associated with obesity, insulin resistance, and dyslipidemia, forming part of the metabolic syndrome spectrum (**Zobaire *et al.,* 2019**). Non-alcoholic fatty liver disease is characterized by excessive lipid accumulation in hepatocytes in the absence of significant alcohol consumption, and may progress to non-alcoholic steatohepatitis (NASH), fibrosis, cirrhosis, and eventually hepatocellular carcinoma if left untreated (**Rohit *et al.,* 2021**). Current therapeutic strategies primarily focus on weight reduction and lifestyle modifications, including dietary interventions, highlighting the urgent need for functional food-based solutions to mitigate disease progression.

In recent years, cereal brans—the outer layers of cereal grains—have garnered increasing attention due to their high content of dietary fibers, phenolic compounds, and other bioactive phytochemicals with potential health-promoting effects **Meydani ,(2009**). Among these, oat bran is particularly rich in soluble fiber, notably β-glucan, which has been shown to reduce serum cholesterol, improve lipid metabolism, attenuate hepatic fat accumulation, and enhance antioxidant defense mechanisms (**El-Sayed *et al.,* 2017**). Additionally, oat-specific polyphenols such as avenanthramides possess anti-inflammatory and hepatoprotective properties (**Chen *et al.,* 2004**).

On the other hand, corn bran, although less studied, represents a valuable source of insoluble fiber and ferulic acid, a potent antioxidant capable of modulating oxidative stress and reducing lipid peroxidation in hepatic tissue (Xue ***et al.,* 2025).** Emerging evidence from animal models suggests that corn bran supplementation may attenuate body weight gain, lower serum lipid levels, and improve liver histology in high-fat diet–induced models of fatty liver

(**Martinez *et al.,* 2023**). Despite these promising findings, comparative studies assessing the relative efficacy of oat bran and corn bran in the context of NAFLD are limited. Understanding their individual and comparative impacts on liver health and metabolic parameters could support the development of effective functional dietary strategies. Therefore, the present study was designed to evaluate and compare the protective effects of dietary supplementation with oat bran and corn bran, at two inclusion levels (2.5% and 5%), in male rats with high-fat diet–induced fatty liver.

Materials and Methods

Materials

- Oat (*Avena sativa* L.) bran and corn (*Zea mays)* bran used in this study were obtained from the Agriculture Research Center, Giza, Egypt.
- All other chemicals, reagents, and solvents were obtained from El-Gomhoria Pharmaceutical Company, Cairo, Egypt.
- Casein, cellulose, vitamins mixture, minerals mixture and formalin were purchased from El-Gomhoria Company, Cairo, Egypt.
- Kits for blood analysis were purchased from Gama Trade Company for Chemicals, Giza, Egypt.

- **Experimental animals:** Forty-two adult male rats (Sprague Dawley strain) weighting about 160 ± 10 g were obtained from the Laboratory Animal Colony, Helwan, Egypt.

Methods

- **Induction of fatty liver:**

Rats were fed on high fat diet used to induce the fatty liver disease according to **(Sara *et al.,* 2016)** containing carbohydrate 55.6 %, starch 21.6 %, sucrose 30 % and fructose 4%.

The experimental design:

- The experiment and biochemical determination were be conducted at Graduate Research Labs, Nutrition and Science Dept., Faculty of Home Economics, Helwan University, Cairo, Egypt. Rats were housed in standard cages at room temperature (25 °C) under a 12-hour light/dark cycle and were given a 7-day adaptation period with free access to standard laboratory diet and water. After acclimatization, the animals were randomly divided into six groups (n = 7 per group). Group 1 received a basal diet for four weeks and served as the negative control, while Group 2 was fed a high-fat diet and served as the positive control. Groups 3 and 4 received the high-fat diet supplemented with 2.5% and 5% oat bran, respectively, and Groups 5 and 6 received the high-fat diet supplemented with 2.5% and 5% corn bran, respectively.

Biological Evaluation;

Feed intake (FI) recorded every day throughout the experiment period (4 weeks). Body weight gain (BWG) and feed efficiency ratio were calculated according to (**chapman *et al*., 1959).**

Blood Collection and Serum Separation:

At the end of the experimental period 4 weeks, rats were fasted overnight before sacrificing and blood samples were collected from each rat and centrifuged at 3000 rpm for 15 min to obtain the serum for biochemical analysis **(Adam *et al*., 2021).**

Biochemical analysis;

Serum total cholesterol (TC), triglyceride (TG) and high-density lipoprotein cholesterol (HDL-C) were determined according to **Richmond, (1973); Wahlefeld, (1974) and Albers *et al.,* (1983),** respectively**.** Low density lipoprotein cholesterol (LDL-c) and very low-density lipoprotein cholesterol (VLDL) were calculated according to **Fridewald *et al.,* (1972).** Aspartate aminotransaminase (AST), alanine aminotransaminase (ALT) and total bilirubin were determined according to the method described by **Young, (2001).** Malondialdehyde (MDA) and **Glutathion peroxydase** (GPX) were determined according to **Draper and Hadley, (1990) and Ugar *et al.,* (2018),** respectively. Serum urea nitrogen and creatinine were determined using the methods of **Lear, (1950) and Pundir *et al.,* (2019)**, respectively.

-Statistical analysis:

The statistical analysis was carry out using SAS statistical software for sensory evaluation of date products. The results were expressed as (mean ± SE). Data was analyzed by one way analysis of variance (ANOVA). The differences between means were tested for significance using least significant difference test (LSD) at ($P < 0.05$) (**Armitage *et al.,* 1987).**

Results and discussion

Table 1 showed the effect of oat and corn brans on body weight status against fatty liver in male rats. Concerning initial body weight, results showed that the + ve control group non-significantly increased compared to the - ve control group with mean values 166.78±1.62 vs. 163.77±1.37 g, respectively. Whereas all tested groups which were fed oat as well as corn brans at different doses non-significantly decreased compared to the +ve control group with mean values 164.16±1.32, 162.85±0.71, 166.33±1.37and 163.50±0.89 vs. 166.87±1.62 g, respectively.

Concerning final body weight, results showed that the + ve control group significantly increased compare to the - ve control group with mean values 246.40±2.13 vs. 214.67±1.24 g, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 223.11±3.93, 219.2±2.64, 214.66±1.45and 215.55±1.13 vs. 246.40±2.13 g, respectively. The most improvement was recorded in rats which fed 2.5% corn bran powder followed by rats fed 5% corn bran powder (Group 5 and 6).

Regarding feed intake, results showed that the + ve control group significantly increased compared to the - ve control group with mean values 22.0 vs. 18.9 g/d/rat, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 18.9, 18.6, 19.6 and 18.5 g/d/rat vs. 22.0 g/d/ rat, respectively. The most improvement was recorded in rats which fed 2.5% oat bran powder followed by rats fed 5% corn bran powder (Group 3 and 6).

With respect to body weight gain, results showed that the positive control group (+ve) exhibited a significant increase compared to the negative control group (–ve), with mean values of 47.80±2.54 vs. 31.12±1.58%, respectively. In contrast, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 35.93±2.60, 34.67±2.18, 29.09±1.82 and 31.83±0.55vs.47.80±2.54%, respectively. The most improvement was recorded in rats which fed 2.5% corn bran powder followed by rats fed 5% corn bran powder (Group 5 and 6).

Related to feed efficiency ratio, results showed that the + ve control group significantly increased compare to the - ve control group with mean values 0.120±0.005 vs. 0.89±0.004, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 0.103±0.007, 0.100±0.005, 0.082±0.004 and 0.093±0.001 vs. 0.120±0.005, respectively. The most improvement was recorded in rats which fed 2.5% corn bran powder followed by rats fed 5% corn bran powder (Group 5 and 6).

The present findings support the beneficial role of dietary cereal brans in modulating body weight status in rats with diet-induced fatty liver. High-fat and hypercholesterolemic diets are known to promote excessive weight gain and liver hypertrophy, which are strongly associated with the progression of non-alcoholic fatty liver disease (NAFLD). Supplementation with oat bran was shown to attenuate these effects, resulting in a reduction in relative liver weight and body fat accumulation. This effect can be attributed to the high content of β-glucan in oat bran, which increases satiety, modulates lipid absorption, and improves metabolic efficiency.

Previous studies have consistently demonstrated that oat β-glucan lowers caloric intake and reduces body weight gain while improving lipid homeostasis in experimental models of fatty liver **(Anne *et al.*, 2014).**

Corn bran supplementation also showed promising effects, although direct evidence in NAFLD models remains less abundant compared to oat bran. Corn bran is particularly rich in insoluble fiber and phenolic compounds such as ferulic acid, which can improve intestinal health, modulate gut microbiota, and indirectly contribute to body weight regulation. Related animal studies on corn-derived products, such as corn peptides and pigmented maize varieties, have reported reduced body weight gain and adiposity in rodents fed obesogenic diets **(Lili *et al.,* 2021**). These findings suggest that corn bran could exert similar protective effects on body weight and metabolic status when included in diets that predispose to fatty liver.

Collectively, the evidence indicates that oat and corn brans exert complementary roles in reducing excessive weight gain and relative liver weight in the context of fatty liver. Their effects are mediated through improved lipid metabolism, antioxidant activity, and enhanced satiety, thereby providing a nutritional strategy to counteract weight-related metabolic disturbances in NAFLD.

Table 2, showed the effect of oat and corn brans on lipid profile against fatty liver in male rats. Concerning total cholesterol (TC), results showed that the + ve control group significantly increased compared to the - ve control group with mean values 215.23±3.36 vs. 135.86±2.15 mg/dl, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 156.49±2.83, 142.49±2.58, 141.18±1.52 and 141.47±1.94 vs. 215.23±3.36 mg/dl, respectively. The most improvement was recorded in rats which fed 2.5% corn bran powder followed by rats fed 5% corn bran powder (Group 5 and 6).

Regarding triglycerides (TG), results showed that the + ve control group significantly increased compared to the - ve control group with mean values 120.53±2.09 vs. 74.32±1.67 mg/dl, respectively. In contrast, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 79.52±2.53, 77.90±1.86, 104.57±1.51 and 91.84±1.31 vs. 120.53±2.09 mg/dl, respectively. The most improvement was recorded in rats which fed 5% oat bran powder followed by rats fed 2.5% oat bran powder (Group 4 and 3).

Concerning high-density lipoprotein (HDL), results showed that the + ve control group significantly decreased compare to the - ve control group with mean values 34.83±0.23 vs. 56.31±0.63 mg/dl, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly increased compared to the +ve control group with mean values 58.32±0.75, 56.77±0.56, 59.42±0.82 and 57.09±0.32 vs. 34.83±0.23 mg/dl, respectively. The most improvement was recorded in rats which fed 2.5% corn bran powder followed by rats fed 2.5% oat bran powder (Group 5and 3).

Pertaining to low-density lipoprotein (LDL), results showed that the + ve control group significantly increased compare to the - ve control group with mean values 156.30±2.81vs. 55.69±1.72 mg/dl, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 82.27±3.31, 70.14±2.44, 60.85±1.50 and 57.09±0.32 vs. 66.01±1.47mg/dl, respectively. The most improvement was recorded in rats which fed 2.5% corn bran powder followed by rats fed 5% corn bran powder (Group 5and 6).

Relating to very low-density lipoprotein (VLDL), results showed that the + ve control group significantly increased compare to the - ve control group with mean values 24.10±0.41 vs. 14.86±0.33 mg/dl, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 15.90±0.50, 15.58±0.17, 20.91±0.30 and 18.36±0.86 vs. 24.10±0.41mg/dl, respectively. The most improvement was recorded in rats which fed 2.5% corn bran powder followed by rats fed 5% corn bran powder (Group 5and 6).

Regarding the corn bran results in the present study, the findings are consistent with those of **Mona *et al.,* (2023),** who reported that the present findings confirm the beneficial impact of oat supplementation on lipid metabolism under hypercholesterolemic conditions. Rats fed a high-cholesterol diet exhibited marked dyslipidemia, including significant increases in total cholesterol, triglycerides, and LDL-C levels, along with a decrease in HDL-C. Supplementation with either dry or germinated oat effectively ameliorated these alterations, lowering total cholesterol, triglycerides, and LDL-C while elevating HDL-C. Germinated oat showed a stronger effect than dry oat, likely due to its higher concentration of bioactive compounds such as β-glucan and antioxidant constituents. These results highlight the hypolipidemic potential of oat in counteracting cholesterol-induced disturbances in lipid profile.

Oat phenolic has been shown to increase the resistance of human LDL to oxidation in a dose dependent fashion (can synergistically increase with vitamin C in diet **Meydani *et al.*, (2009).** Also, **Whitehead *et al*., (2014)** reported that consuming oat β- glucan with a molecular weight (MW) reduced serum total LDL cholesterol in humans. All treatments showed improved in VLDL-c values.

In addition, no significant difference was observed between groups fed on dry and germinated oat that with normal control group. The decrease in VLDL-C may be due to soluble dietary fiber content in oat especially β- glucan. Previous research by **Martinez *et al*., (2023)** reported that β- glucan in whole grain decrease lipid blood.

Table 3, showed the effect of oat and corn brans on liver function against fatty liver in male rats. As regards Alanine Aminotransferase (ALT), results showed that the + ve control group significantly increased compare to the - ve control group with mean values 98.79±0.97 vs. 34.34±0.07 µ/L, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 62.81±2.67, 47.11±2.50, 65.98±1.13 and 39.90±0.82 vs. 98.79±0.97 µ/L, respectively. The most improvement was recorded in rats which fed 5% corn bran powder followed by rats fed 5% oat bran powder (Group 4 and 6).

As regards alkaline phosphatase (ALP), results showed that the + ve control group significantly increased compare to the - ve control group with mean values 239.47±0.49 vs. 157.46±0.38 mg/dL, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the

+ve control group with mean values 167.77±0.28, 165.04±0.44, 169.49±0.31 and 164.64±0.50 vs. 239.47±0.49 mg/dl, respectively. The most improvement was recorded in rats which fed 5% corn bran powder followed by rats fed 5% oat bran powder (Group 4 and 6).

With respect to Aspartate Aminotransferase (AST), results showed that the + ve control group significantly increased compare to the - ve control group with mean values 128.01±2.74 vs 44.33±2.18 µ/L, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 75.92±1.74, 66.92±1.71, 52.88±3.10 and 49.87±1.20 vs. 128.01±2.74 µ/L, respectively. The most improvement was recorded in rats which fed 5% corn bran powder followed by rats fed 2.5% corn bran powder (Group 5 and 6).

Zhicui *et al.,* (2022) reported that the mean ALT and AST levels were higher in the toxicity group compared to the normal control group; however, corn bran treatment ameliorated this damage. As shown, ALT and AST levels in the groups fed oat or corn bran decreased significantly compared to those in the HFD model group, in a dose-dependent manner. These results suggest that corn peptides (CPs) may help mitigate liver injury by reducing ALT and AST levels. Given the known antioxidative activity of corn bran, it is hypothesized that these peptides could protect the liver through their antioxidant properties. Moreover, the antioxidant effects of both tested materials may play an important role in alleviating oxidative stress, as demonstrated by the present findings. **Haddad *et al.,* (2013)** reported that in conditions of metabolic stress and fatty liver, dietary supplementation with oat bran or oat β-glucan has been shown to enhance renal function. This improvement is reflected by significant decreases in serum creatinine, urea, and uric acid levels, in addition to partial restoration of kidney histological structure when compared with high-fat or diabetic controls. Feeding on high-fat or high-fructose diets is known to provoke both hepatic steatosis and renal lesions, yet the inclusion of cereal brans has been reported to alleviate these alterations, an effect likely related to reductions in systemic oxidative stress and stimulation of antioxidant enzyme activity. Although direct experimental evidence on the impact of raw corn bran in non-alcoholic fatty liver disease is limited, research on corn-derived products such as corn peptides, as well as mixed cereal interventions that incorporate corn bran, has demonstrated improvements in renal markers. These findings suggest that corn-based dietary fibers and bioactive compounds may exert a protective influence on kidney function under conditions of fatty liver, thereby justifying further investigation into their potential therapeutic role.

Table 4, showed the effect of oat and corn brans on urea, results showed that the + ve control group significantly increased compare to the - ve control group with mean values 75.05±0.61 vs. 35.96±0.43 mg/dl, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 39.78±0.81, 41.51±0.37, 40.28±0.41 and 39.37±0.58 vs. 75.05±0.61 mg/dl, respectively. The most improvement was recorded in rats which fed 5% corn bran powder followed by rats fed 5% oat bran powder (Group 4 and 6).

Pertaining creatinine, results showed that the + ve control group significantly increased compare to the - ve control group with mean values 1.88±0.019 vs. 0.50±0.017 mg/dl, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 0.69±0.017, 0.60±0.035, 0.69±0.023 and 0.56±0.027 vs. 1.88±0.019 mg/dl, respectively. The most improvement was recorded in rats which fed 5% corn bran powder followed by rats fed 5% oat bran powder (Group 4 and 6).

With respect uric acid, results showed that the + ve control group significantly increased compare to the - ve control group with mean values 7.65±0.27 vs. 3.15±0.33 mg/dl, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 4.19±0.23, 3.68±0.12, 5.32±0.13 and 3.43±0.19 vs. 7.65±0.27 mg/dl, respectively. The most improvement was recorded in rats which fed 5% corn bran powder followed by rats fed 5% oat bran powder (Group 4 and 6).

These results are in agreement with **Haddad *et al* ., (2013),** who reported that cereal bran supplementation improved renal biochemical parameters and attenuated histopathological alterations associated with dyslipidemia. The beneficial effects of bran supplementation may be attributed to its high content of soluble fibers, antioxidants, and bioactive compounds, which improve lipid metabolism, reduce oxidative stress, and thereby protect renal tissues from secondary damage induced by hypercholesterolemia.

This finding is consistent with the well-known impact of hyperlipidemia on renal clearance and nitrogen metabolism, who reported that **Mona *et al*., (2023**), supplementation with oat products, however, exerted a clear protective effect. These reductions reflect improved renal excretory function and a mitigation of metabolic stress induced by the HC diet. The beneficial effects of oat may be attributed to its high β-glucan content, which has been reported to improve renal function through its hypolipidemic, antioxidant, and anti-inflammatory activities. Collectively, these findings suggest that both dry and germinated oat can effectively ameliorate renal dysfunction associated with hypercholesterolemia, with dry oat showing slightly superior improvement in serum urea levels.

Honzumi *et al*., (2018) discovered that there is a connection between the decreased megalin and the increased cholesterol loading on the kidney, and that the excess cholesterol is absorbed into the renal tubule epithelial cells where it inhibits cell proliferation, possibly contributing to kidney damage. All treated rats which were fed on dry and germinated oat showed a significant decrease of creatinine as compared to the positive control group. The best results of creatinine were to dry oat 30%.

Table 5, showed the effect of oat and corn brans on serum antioxidant against fatty liver in male rats. Concerning malondialdehyde (MDA), results showed that the + ve control group significantly increased compare to the - ve control group with mean values 122.67±0.77 vs. 38.40±0.33 ng/mL, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly decreased compared to the +ve control group with mean values 81.01±0.59, 75.81±0.34, 80.41±0.38 and 70.01±0.32 vs. 122.67±0.77 ng/mL, respectively. The most improvement was recorded in rats which fed 5% corn bran powder followed by rats fed 5% oat bran powder (Group 6 and 4).

Concerning glutathione peroxidase (GPX), results showed that the + ve control group significantly decreased compared to the - ve control group with mean values. 21.25±0.37 vs. 80.54 ±0.44 ng/mL, respectively. Whereas, all tested groups which were fed oat as well as corn brans at different doses significantly increased compared to the +ve control group with mean values 60.04±0.35, 72.51±0.80, 66.47±0.63 and 75.38±0.49 vs. 21.25±0.37 ng/mL, respectively. The most improvement was recorded in rats which fed 5% corn bran powder followed by rats fed 5% oat bran powder (Group 4 and 6).

findings are consistent with those of **Zhicui *et al.*, (2022),** who reported that corn bran reduced MDA levels, particularly in the high-dose group. Similar results were observed in liver tissue. The decreases in SOD and GPX activity, along with the increase in MDA levels in the HFD group, indicate impairment of the antioxidant defense system, which was partially alleviated by corn bran.

Recent findings align with earlier animal studies that demonstrated the hepatoprotective effect of oat supplementation. **El-Sayed *et al.*, (2017)** observed that oat bran administration reduced MDA while enhancing antioxidant enzymes in rats with chemically induced liver damage. Similarly, **Lili *et al.*, (2021)** reported that oat polyphenols attenuated oxidative stress markers in experimental models. These findings are consistent with earlier studies showing that dietary oat bran and its phenolic constituents exert strong antioxidant in experimental models **Chen *et al.*, (2004).** The soluble fiber (β-glucan) and polyphenols present in oat bran have been reported to modulate oxidative stress and enhance antioxidant defense systems **Xue *et al.*, (2025).**

Also, in results rodent models of hepatic injury and diet-induced fatty liver, corn-derived interventions — particularly corn peptides and some processed corn-bran preparations — have been shown to reduce lipid peroxidation (lower MDA) and to elevate endogenous antioxidant defenses such as glutathione peroxidase (GPx). For instance, corn peptides decreased serum MDA and increased GPx activity in experimental liver-injury models, and processed corn bran preparations altered serum/liver MDA and GPx measured by assay kits in feeding studies **Kang *et al*., (2022)**

Table 1. Effect of oat and corn brans on body weight status against fatty liver in male rats

Groups	IBW g	FBW g	FI g/d/rat	BWG %	FER
Control (-Ve)	163.77±1.37[a]	214.67±1.24[c]	18.9	31.12±1.85[bc]	0.089±0.004[bc]
Control (+Ve)	166.78±1.62[a]	246.40±2.13[a]	22.0	47.80±2.54[a]	0.120±0.005[a]
2.5% oat bran powder	164.16±1.32[a]	223.11±3.93[b]	18.9	35.93±2.60[b]	0.103±0.007[b]
5% oat bran powder	162.85±0.71[a]	219.2±2.64[bc]	18.6	34.67±2.18[bc]	0.100±0.005[b]
2.5% corn bran powder	166.33±1.37[a]	214.66±1.45[c]	19.6	29.09±1.82[c]	0.082±0.004[c]
5% corn bran powder	163.50±0.89[a]	215.55±1.13[c]	18.5	31.83±0.55[bc]	0.093±0.001[bc]

Values were expressed as Means ± SE.
Values at the same column with different superscript litters are significant at $P<0.05$

Table 2. Effect of oat and corn brans on lipid profile against fatty liver in male rats

Groups	TC mg/dl	TG mg/dl	HDL mg/dl	LDL mg/dl	VLDL mg/dl
Control (-Ve)	135.86±2.15^{c}	74.32±1.67^{d}	65.31±0.63^{a}	55.69±1.72^{d}	14.86±0.33^{c}
Control (+Ve)	215.23±3.36^{a}	120.53±2.09^{a}	34.83±0.23^{c}	156.30±2.81^{a}	24.10±0.41^{a}
2.5% oat bran powder	156.49±2.83^{b}	79.52±2.53^{d}	58.32±0.75^{b}	82.27±3.31^{b}	15.90±0.50^{c}
5% oat bran powder	142.49±2.58^{c}	77.90±1.86^{d}	56.77±0.65^{b}	70.14±2.44^{c}	15.58±0.17^{c}
2.5% corn bran powder	141.18±1.52^{c}	104.57±1.51^{b}	59.42±0.82^{b}	60.85±1.50c^{d}	20.91±0.30^{b}
5% corn bran powder	141.47±1.94^{c}	91.84±1.31^{c}	57.09±0.32^{b}	66.01±1.47c^{d}	18.36±0.86^{c}

Values were expressed as Means ± SE.
Values at the same column with different superscript litters are significant at P<0.05

Table 3. Effect of oat and corn brans on liver function against fatty liver in male rats

Groups	ALT µ/L	ALP mg/dL	AST µ/L
Control (-Ve)	34.34±1.07^{e}	157.46±0.38^{d}	44.33±2.18^{e}
Control (+Ve)	98.79±0.97^{a}	239.47±0.49^{a}	128.01±2.74^{a}
2.5% oat bran powder	62.81±2.67^{b}	167.77±0.28^{b}	75.92±1.74^{b}
5% oat bran powder	47.11±2.50^{c}	165.04±0.44^{c}	66.92±1.71^{c}
2.5% corn bran powder	65.98±1.13^{b}	169.49±0.31^{b}	52.88±3.10^{d}
5% corn bran powder	39.90±0.82^{d}	164.64±0.50^{c}	49.87±1.20^{de}

Values were expressed as Means ± SE.
Values at the same column with different superscript litters are significant at P<0.05

Table 4. Effect of oat and corn brans on Kidney Functions against fatty liver in male rats

Groups	Urea (mg/dl)	Creatinine mg/dl	Uric acid (mg/dl)
Control (-Ve)	35.96±0.43^{d}	0.50±0.017^{d}	3.15±0.33^{d}
Control (+Ve)	75.05±0.61^{a}	1.88±0.019^{a}	7.65±0.27^{a}
2.5% oat bran powder	39.78±0.81^{c}	0.69±0.017^{b}	4.19±0.23^{c}
5% oat bran powder	41.51±0.37^{b}	0.60±0.035^{c}	3.68±0.12^{cd}
2.5% corn bran powder	40.28±0.41b^{c}	0.69±0.023^{b}	5.32±0.13^{b}
5% corn bran powder	39.37±0.58^{c}	0.56±0.027^{cd}	3.43±0.19^{d}

Values were expressed as Means ± SE.
Values at the same column with different superscript litters are significant at P<0.05.

Table 5. Effect of oat and corn brans on serum malondialdehyde (MDA) and glutathione peroxidase (GPX)antioxidant against fatty liver in male rats

Groups	MDA ng/mL	GPX U/mL
Control (-Ve)	38.4٠±٠.33^{e}	80.54±0.44^{a}
Control (+Ve)	122.67±0.77^{a}	21.25±0.37^{e}
2.5% oat bran powder	81.01±0.59^{b}	60.04±0.35^{d}
5% oat bran powder	75.81±0.34^{c}	72.51±0.80^{b}
2.5% corn bran powder	٨٠.٤1±٠.38^{b}	66.47±0.63^{c}
5% corn bran powder	70.01±0.32^{d}	75.38±0.49^{b}

Values were expressed as Means ± SE.
Values at the same column with different superscript litters are significant at P<0.05

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