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Original article

Effect of *Launaea taraxacifolia* Leaf-based Diet on Enzymes and Biomarkers of Selected Tissues of High-fat Diet-Induced Hyperlipidemic Rats

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Abstract
The study investigated the effects of *Launaea taraxacifolia* leaf-based diet at 6.25% - 25% inclusion levels on selected enzymes and biomarkers of selected tissues of high-fat diet-induced hyperlipidemic rats. 36 female rats weighing 165.82 ± 2.10g were assigned to groups A (6) and B (30). Animals in group B were made hyperlipidemic by feeding on a high-fat diet for six weeks and were later reassigned into six groups as non-treated, atorvastatin-treated and *Launaea taraxacifolia* leaf-based diet-treated (6.25%, 12.5%, and 25% inclusion) and were maintained on their respective diets for six weeks. The activities/concentrations of enzymes/biomarkers in the selected tissues: liver (lactate dehydrogenase, alanine aspartate amino transferases, gamma glutamyl transferase), heart (acid phosphatase, creatinine kinase), serum (lactate dehydrogenase, alkaline and acid phosphatases, alanine, aspartate amino transferases, gamma glutamyl transferase, albumin, bilirubin, urea, uric acid and creatinine) were determined using standard methods. Results revealed that *Launaea taraxacifolia*-treated animals showed a significant reduction in serum creatinine, uric acid, urea, and serum protein, while a significant increase in creatinine kinase indicated a reduction in hyperlipidemic condition. Overall, the results from the study indicate that the leaves of *Launaea taraxacifolia* can reverse hyperlipidemia.
Keywords. *Launaea taraxacifolia,* Leaf-based Diet, Enzymes, Biomarkers.

Introduction

Hyperlipidemia is a condition characterized by increased concentration of lipids (fats) in the bloodstream. Hyperlipidemia is one of the important factors associated with atherosclerosis, others being hypertension, smoking in humans, diabetes mellitus, and other factors. Hyperlipidemia, atherosclerosis, and related cardiovascular diseases have become a major health problem in the world recently [1]. Statins are the common drugs used to manage hyperlipidemia as they inhibit 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase, thereby interrupting the conversion of HMG-CoA to mevalonate. The effectiveness of statins is not without side effects [2-3], necessitating the need for natural alternatives.

Launaea taraxacifolia (Asteraceae), also known as wild lettuce, is found mainly in tropical Africa. In Nigeria, the Hausa tribe call it Namijin dayii, Nomen barewa, and Nonan Barya', while the Yoruba tribe calls it 'Efo Yanrin and Odundun Odo'[4]. The plant over the years has been reported to possess many ethnopharmacological properties on disease conditions such as water retention disorders, conjunctivitis, yaws, improper bone fixation in infants, and diabetes mellitus [3]. *Launaea taraxacifolia* leaves have been documented to have hypolipidaemic effects [4]. The investigators showed that lipid accumulation induced with 0.1mM oleic acid in HepG2 cell lines was reversed when the cell lines were treated with 20 $\mu g/\mu l$ of 50 % hydroethanolic extract of the plant. An *in vivo* study with Wistar rats also showed that *Launaea taraxacifolia* significantly decreased blood cholesterol and triglyceride levels significantly [4-5]. The efficacy and mechanisms of action of the plant have not been tested scientifically in most cases in order to justify its continuous use in traditional folk medicine as an anti-hyperlipidemic agent. The medicinal properties of the plant may be due to one or more of its phytochemical constituents. However, some of these compounds may be toxic, and thus the plants containing them could confer varied levels of toxicity to an individual consuming them.

Materials and Methods

Plant collection, authentication, and preparation

Launeae taraxacifolia (Wild lettuce) was harvested on a farm at Ojutaye, Ilorin, Kwara state, Nigeria. It was authenticated at the herbarium unit of the Department of Plant Biology, University of Ilorin, Kwara state, where a voucher specimen (UIH1023) was deposited. The fresh leaves were thoroughly washed, dried at 60oC, and later pulverized into powder using an electric blender.

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Laboratory Animals

Thirty six female albino rats (*Rattus novergicus*) (165.82 ± 2.10g, 5- 7 weeks old) were obtained from the animal holding unit of the Department of Biochemistry, Faculty of Life Sciences, University of Ilorin, Ilorin, Nigeria and was kept in well-ventilated house conditions with free access to rat pellets and tap water before the experiment commenced.

Feed Ingredients

Yellow maize seed, soy beans, and cellulose (corn corb) obtained from Oke-oyi market in Ilorin, Nigeria. Beef tallow was obtained from the Mandate market in Ilorin. Vitamin/Mineral mix and D-Methionine were products of Rofat Feed Nigeria Limited in Ilorin, Nigeria, while Soybean oil and Sucrose were products of Sunola Refined Soybeans, Kewalram Nigeria Limited, Nigeria, and Saint Louis Sucre, Nigeria, respectively.

Chemicals and Reagents

Atorvastatin was a product of Juhel Nigeria Ltd, while assay kits were products of Monobind Inc., Lake Forest, USA. All other chemicals and reagents used were of analytical grade, which were obtained from Sigma Aldrich Limited, Buchs, Canada.

Animal Grouping, Composition of Diet, and Induction of Hyperlipidemia

After a week of acclimatization, the animals were weighed (initial weight) and assigned into two groups: A (6 rats {control diet}) and group (30 rats {High-fat diet induced hyperlipidemic rats}(modification of [6]. They were all fasted for 12 hours to ensure complete emptying of the stomach before feeding them on their new diets for a period of six weeks (Feed ingredients were weighed, out, thoroughly mixed manually until homogenous and made into pellet) (Table 1) for a period of six weeks. Hyperlipidemia was confirmed by estimation of some growth performance characteristics and determination of serum lipid profile. (Aliquots of the blood sample were obtained through ocular puncture, and the serum was prepared according to the procedure described by [7].

Table 1. Feed Composition for High Fat Diet

Ingredients (g/kg)	Control Diet (g/kg)	High Fat Diet (g/kg)
Corn Starch	516	166
Animal Fat (Beef Tallow)	-	350 -
Soybean	230	230
Soybean Oil	50	50
Cellulose	50	50
Sucrose	100	100
Vitamin/Mineral	50	50
D-Methionine	4	4
Total	**1000**	**1000**

** Vitamin/Mineral mix: Vitamin A 4,000,000 i.u; Vitamin D_3, 800,000 i.u.; Tocopherols, 400 i.u; Vitamin K_3 800mg , Folacin, 200mg; Thiamine, 600mg; Riboflavin 1,800mg; Niacin, 6000mg; Calcium pathothenate, 4 mg; Biotin, 8 mg; Manganese, 30,000mg, Zinc, 20,000mg; 8,000mg; Choline chloride 80,000mg; Copper, 2,000mg; Iodine, 480mg; Cobalt, 80 mg; Selenium, 40mg; BHT, 2,500mg. Anticaking agent, 6000mg.*
Unit of diet composed – g/ kg.

Composition of Diets, Animal Re-grouping and Sacrifices

The animals fed on a high-fat diet were re-grouped into five groups after confirmation of hyperlipidemia, with group A still being fed on the control diet. The new groups (B - F) were reassigned into non-treated, atorvastatin (0.06 mg/kg bwt) treated, and *launaea taraxacifolia* leaf-based diet treated (6.25%, 12.5%, and 25% inclusion levels) (Table 2) and fed on diets for six weeks (Table 3). During this period, the growth performance characteristics (feed intake) [8], weight gain, body mass index [9], and hip circumference [10] were re-measured. They were then fasted for 12 hours to ensure complete gastric emptying. They were then anesthetized using diethyl ether and dissected.

Table 2: Re-grouping and Treatment of Animals in Group B

B	Rat fed on high fat diet with no treatment
C	Rats fed on high fat diet and treated with atorvastatin (0.06 mg/kg bwt)
D-F	Rats fed on high fat diet and treated with *launaea taraxacifolia* leaf-based diet at 6.25%, 12.5% and 25% inclusion levels respectively

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Preparation of Serum and Tissues (liver, Kidney, and Heart) Supernatant

At the end of the experimental period, all animals in each group were anesthetized using diethyl ether and sacrificed by jugular puncture. The blood samples were collected into EDTA bottles to prevent clotting. These were then subjected to centrifugation to separate the serum from plasma at 3000 x g for 10 min, which was then stored in the refrigerator prior to use. The tissues were weighed and homogenized using 250mm sucrose buffer and centrifuged at 3000 x g for 10 min. The supernatant was collected and stored in the refrigerator for further biochemical assays at 40 °C.

Determination of serum and liver enzymatic activities

Alkaline phosphatase activity assay was carried out as described by [11], Alanine Aminotransferase (ALT) and Aspartate Aminotransferase activities were carried out as described by [12], Lactate Dehydrogenase (LDH) activity was described by [13], while Gamma Glutamyltransferase (GGT) activities *was* described by [14].

Determination of liver function indices

The activities of Serum Albumin were carried out as described by [15] while Bilirubin activities were determined as described by [16].

Statistical Analysis

Each data point represents the mean of six replicates ± SEM, except for results from the nutritional/chemical constituents of the leaves, which represent the mean of three replicates ± SEM. All results were statistically analyzed using one-way ANOVA and Duncan's Multiple Range Test (DMRT) [17]. Differences between group means were considered significant at $p<0.05$.

Toxicological studies

Effect of Launeae taraxacifolia leaf-based diet on serum enzymatic parameters of high-fat diet-induced hyperlipidemic rats.

The effect of *Launeae taraxacifolia* leaf-based diet on serum enzymatic parameters of high fat diet-induced hyperlipidemic rats (table 3) showed that the ACP value of the untreated group B was significantly higher ($p>0.05$) when compared with the control group while there is no significant difference ($p<0.05$) in all other groups when compared with the control group. For LDH, group B (untreated) was significantly higher ($p>0.05$) than the control group and other groups, no significant difference ($p<0.05$) in the control group and group F that was fed with 25% *Launaea taraxacifolia* meal-based diet, while group C (0.06mg/kg B.wt artorvastatin), D (6.25%) and E (12%) compared favorably with each other.

Additionally, the serum concentrations of ALT, ALP, AST and GGT of the untreated group B showed a significant difference ($p>0.05$) when compared with the control group while there was no significant differences ($p<0.05$) between group D (6.25%), E (12%) and F (25%) *L. taraxacifolia* and the control group.

The effect of *Launeae taraxacifolia* meal-based diet on Liver enzymatic parameters of high fat diet-induced hyperlipidemic rats is (table 4) showed no significant difference ($p>0.05$) in the control group A, group C, (0.06mg/kg B.wt artorvastatin), group D (6.25%), and E (12.5%) and F (25%) except for group B (untreated) which was significantly diffrent ($p<0.05$)compare to the control group and other groups.

For ALT, ALP and AST, the concentrations were of no significant differences between group C (0.06mg/kg B.wt artorvastatin), D (6.25%), E (12.5%) and F (25%) when compared to the control group while the untreated group B shows a highly significant difference ($p<0.05$) from the control group and other groups. The same trend was recorded for gamma-glutamyl transferase (GGT) across the studied groups.

The effect of *Launeae taraxacifolia* meal-based diet on liver function indices of high fat diet-induced hyperlipidemic rats (table 5) showed no significant difference between ($p>0.05$) the albumin concentrations of group (0.06mg/kg B.wt artorvastatin), D (6.25%), E (12.5%) and F (25%) and that of the control group while group B (untreated) was significantly lower ($p<0.05$) compare to the control group and others. Direct and Total bilirubin study also shows no significant difference ($p<0.05$) between the control group and other groups, except for C(untreated), whose value was significantly higher ($p<0.05$) than that of the control group A.

The effect of *Launaea taraxacifolia* leaf-based diet on kidney function indices of high fat diet-induced hyperlipidemic rats (6) showed was no significant difference between ($p>0.05$) the creatinine level of group C (0.06mg/kg B.wt artorvastatin), D (6.25%), E (12.5%) and F (25%) and that of the control group while group B (untreated) is significantly different ($p<0.05$) from the control group and others. Also, uric acid concentration shows no significant difference ($p<0.05$) between the control group and other groups except for C(untreated), whose value was significantly higher ($p<0.05$) than that of the control group A.

For urea, group C (0.06mg/kg B.wt artorvastatin), D (6.25%), E (12.5%) and F (25%) shows a significant difference ($p<0.05$)when compared with the control group but compared favorably to each other slightly higher than the control group where as group B (untreated) was significantly higher ($p<0.05$) than the control group.

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Table 3. Effect of Launaea taraxacifolia meal-based diet on serum enzymatic parameters of high-fat diet-induced hyperlipidemic rats

Parameters	Control	Untreated	0.06mg/kg B.wt Atorvastatin	HFD + 6.25% *L. taraxacifolia*	HFD + 12.5% *L. taraxacifolia*	HFD + 25% *L. taraxacifolia*
ACP	78.04±0.2^{a}	85.15 ± 2.56^{b}	79.55 ± 1.54^{a}	78.66 ± 0.75^{a}	79.87 ± 0.84^{a}	79.70 ± 3.05^{a}
LDH	46.15± 2.49^{a}	77.2 ± 0.37^{c}	58.83± 1.49 ^{b}	48.6±2.145^{a}	46.09 ± 1.59^{a}	45.86 ± 1.09^{a}
ALT	22.73± 0.2a	31.88± 0.37 ^{b}	21.35± 0.17 ^{a}	22.97± 0.69 ^{a}	21.54± 0.68 ^{a}	20.29± 1.13 ^{a}
ALP	52.96 ±1.42 ^{a}	63.14 ± 5.35^{b}	52.15 ±3.75^{a}	50.07± 0.63^{a}	50.66 ± 0.63^{a}	51.58 ± 1.64^{a}
AST	13.27± 0.09 ^{a}	21.94± 0.74 ^{b}	12.04 ± 0.075^{a}	12.42± 0.63 ^{a}	12.93± 0.61 ^{a}	12.95± 1.30 ^{a}
GGT	149.0± 4.16 ^{a}	189.2± 0.09 ^{c}	154.1 ±7.08 ^{b}	145.1± 6.28 ^{a}	143.8± 5.60 ^{a}	148.5± 8.69 ^{a}

Values carrying different superscripts are along the same row for each parameter and are significantly different (P < 0.05). Data are means of six determinations ± SEM

Key: ACP – Acid phosphatase, LDH- Lactate dehydrogenase, ALT – Alanine aminotransferase, ALP – Alkaline phosphatase, AST – Aspartate aminotransferase, Gamma glutamyl transferase

Table 4. Effect of Launaea taraxacifolia meal-based diet on liver enzymatic parameters of high-fat diet-induced hyperlipidemic rats

Parameters	Control	Untreated	0.06mg/kgB.wt Atorvastatin	HFD+ 6.25%*L. taraxacifolia*	HFD+ 12.5%*L. taraxacifolia*	HFD+ 25%*L. taraxacifolia*
LDH	293.8±6.21^{a}	230.2 ± 1.13^{c}	276.3± 2.06 ^{b}	286.2± 5.23 ^{a}	289.3± 3.65 ^{a}	290.3±1.5^{a}
ALT	85.3±1.54 ^{a}	71.17 ±0.82 ^{c}	84.7 ± 3.41 ^{a}	84.56± 0.62 ^{a}	85.32± 3.33 ^{a}	85.81±2.4^{a}
AST	27.52± 1.15 ^{a}	21.86± 0.03 ^{b}	27.89± 0.97 ^{a}	24.12± 0.16 ^{a}	25.29± 0.65 ^{a}	27.56±0.7^{a}
ALP	83.54 ± 3.00 ^{a}	71.54± 0.18 ^{b}	84.11 ± 3.00 ^{a}	82.05± 7.46 ^{a}	86.44± 5.24 ^{a}	88.45±3.7^{a}
GGT	228.7±40.46 ^{a}	258.8 ±17.3 ^{b}	229.6 ±7.88 ^{a}	227.37±6.14^{a}	228.8±5.08 ^{a}	229.9±0.2^{a}

Values carrying different superscripts are along the same row for each parameter and are significantly different (P < 0.05). Data are means of six determinations ± SEM

Key:, LDH- Lactate dehydrogenase, ALT – Alanine aminotransferase, ALP – Alkaline phosphatase, AST – Aspartate aminotransferase, GGT – Gamma-glutamyl transferase

Table 5. Effect of Launaea taraxacifolia meal-based diet on Kidney function indices of high-fat diet-induced hyperlipidemic rats

Parameters	Control	Untreated	0.06mg/kg B.wt Atorvastatin	HFD + 6.25% L. taraxacifolia	HFD + 12.5% L. taraxacifolia	HFD + 25%L. taraxacifolia
Creatinine	2.836 ±0.10 ^{a}	3.880± 0.46^{b}	2.744± 0.13 ^{a}	2.909± 0.3^{a}	2.605± 0.6^{a}	2.305± 0.16^{a}
Urea	70.83± 0.67 ^{a}	75.5 ± 1.36^{c}	73.16± 0.64 ^{b}	73.74± 1.9^{b}	73.26± 1.0^{b}	72.54± 1.23^{b}
Uric acid	1.485± 0.04 ^{a}	2.486± 0.03^{b}	1.429± 0.01 ^{a}	1.470± 0.2^{a}	1.429± 0.08^{a}	1.274± 0.0^{a}

Values carrying different superscripts are along the same row for each parameter and are significantly different (P < 0.05). Data are means of six determinations ± SEM

Effect of Launaea taraxacifolia meal-based diet on heart enzymatic parameters of high-fat diet-induced hyperlipidemic rats

The effect of *Launaea taraxacifolia* meal-based diet on Acid phosphatase of the heart of high fat diet-induced hyperlipidemic rats (figure 1) displayed a significant difference in the activity of acid phosphatase of group untreated group and group D fed with 6.25% *L.taraxacifolia* when compared to the control group while there was no significant difference between group C (0.06mg/kg B.wt artorvastatin), E (12.5%) and F(25%) and that of the control group.

The effect of *Launaea taraxacifolia* leaf-based diet on creatine kinase of the heart (Figure 2) showed a significant difference (p> 0.05) in the creatine kinase of group B (untreated) compared to the control group. However, group C (0.06mg/kg B.wt atorvastatin) and F (HFD + 25% *L. taraxacifolia*) compared favorably with each other, with no significant difference from the control group (p>0.05). Also, group D (HFD + 6.25% *L. taraxacifolia*) and E (HFD + 12.5% *L. taraxacifolia*) compared favorably with each other but showed a significant difference (p< 0.05) when compared with the control group.

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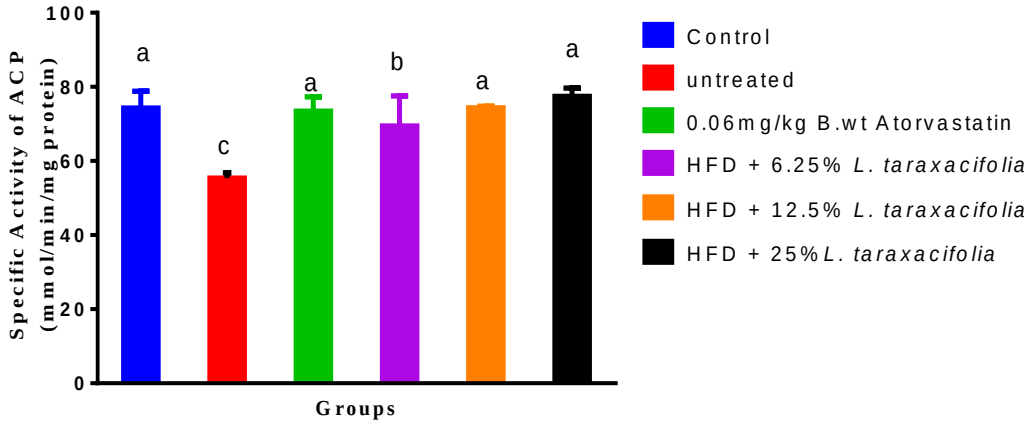

Figure 1. Effect of Launaea taraxacifolia on acid phosphatase activity of high-fat diet induced hyperlipidemic Wistar rats. Bars carrying different superscripts for each parameter are significantly different (P < 0.05). Data are means of six determinations ± SEM
Key: ACP – Acid phosphatase

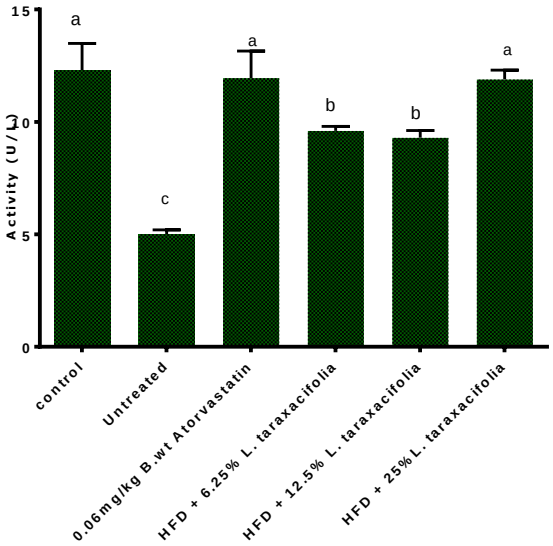

Figure 2. Effect of Launaea taraxacifolia on creatine kinase activity of high-fat diet induced hyperlipidemic wistar rats. Bars carrying different superscripts for each parameter are significantly different (P < 0.05). Data are means of six determinations ± SEM

Effect of Launaea taraxacifolia meal-based diet on serum lipid profiles of high-fat diet-induced hyperlipidemic rats

The effect of *Launaea taraxacifolia* meal-based diet on serum lipid profiles of high-fat diet-induced hyperlipidemic rats (Table 6) showed a significant difference (p> 0.05) in the cholesterol level of group B (untreated) compared to the control group. There was also a significant difference (p> 0.05) in the cholesterol level of group C administered (0.06mg/kg B.wt atorvastatin) when compared to the control group and other groups fed with *L. taraxacifolia* meal-based diet. However, group D (HFD + 6.25% *L. taraxacifolia*), E (HFD + 12.5% *L. taraxacifolia*), and F (25% *L. taraxacifolia*) compared favorably with each other and showed no significant difference (p< 0.05) when compared to the control group.

For LDL (low density lipoprotens), the untreated group was significantly higher (p> 0.05) when compared to the control group while group C (0.06mg/kg B.wt atorvastatin), D (6.25% *L. taraxacifolia*) and E (12.5% *L. taraxacifolia*) compared favorably with each other but showed a significant difference (p> 0.05) when compared to the group. However, there was no significant difference (p<0.05) between the control group and group F (25% *L. taraxacifolia*). For the serum triglycerides, there was no significant difference (p<0.05) between group C (0.06mg/kg B.wt artorvastatin), D (6.25% *L. taraxacifolia*), E (12.5%) and F(25%) and that of the control group except for the untreated group which was significantly higher compared to other groups and the control group. Morealso, there was no significant difference (p> 0.05) in the HDL level of group C (0.06mg/kg B.wt artorvastatin), D (6.25% *L. taraxacifolia*), E (12.5%) and F(25%) and that of the control group except for the untreated group which was significantly lower (p< 0.05) compared to other groups and the control group.

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Table 6. Effect of Launaea taraxacifolia leaf-based diet on serum lipid profiles of high-fat diet-induced hyperlipidemic rats

Parameters	Control	Untreated	0.06mg/kg B.wt Atorvastatin	HFD+ 6.25% *L. taraxacifolia*	HFD + 12.5% *L. taraxacifolia*	HFD + 25%*L. taraxacifolia*
Total cholesterol	23.15±0.45[a]	31.48±0.1[c]	20.26±0.9[b]	22.14± 0.66[a]	23.04 ± 0.66 [a]	24.29 ± 0.30[a]
LDL	5.54±0.36 [a]	8.76±0.08[c]	7.20 0.73 [b]	7.453± 0.50 [b]	7.23±0.19[b]	6.526 ± 1.21 [a]
Triglycerides	6.80±0.45[a]	9.66±0.22[c]	6.11±0.28 [a]	6.726± 1.38 [a]	6.68± 0.19[a]	6.070 ± 0.01 [a]
HDL	13.98±0.52 [a]	8.23±1.39[c]	13.67±0.3[a]	12.28± 0.40 [a]	13.07± 0.40[a]	13.92 ± 0.16 [a]

Values carrying different superscripts are along the same row for each parameter and are significantly different (P < 0.05). Data are means of six determinations ± SEM
Key: LDL –low density lipoprotein; HDL – high density lipoprotein

Discussion

Serum biochemical parameters are diagnostic markers of liver and kidney function. The results of concentrations of liver marker enzymes (ALP, AST, and ALT) show the ameliorative properties of this plant, which may probably be due to the presence of several bioactive compounds like flavonoids, saponins and tannins [18]. In similarity with other work that has been done on this plant, It has been concluded that the leaves of this plant can be eaten and taken as a concoction without dangers associated with toxicity [19-23]. Lactate dehydrogenase (LDH) is a cytoplasmic enzyme present in essentially all major organ systems. Ingestion of certain drugs, toxins, and chemical poisons is among the major factors for LDH release to the extracellular space. The result of this study revealed that the mean serum level of LDH in *L. taraxacifolia* treated rats showed a non-significant elevation artorvastatin administered rats. Previously published works reported by [24-25] indicate that statin drugs can increase serum LDH, especially when it has been taken together with other drugs.

According to [26], plasma creatinine concentration is a better indicator than urea concentration in the first phase of kidney toxicity. These two parameters are products of protein breakdown and metabolism in the body [27], while uric acid is a product of purine metabolism. High levels of creatinine are found in renal dysfunction or muscle injury [28]. *Launaea taraxacifolia* -treated animals showed a significant reduction in serum creatinine, uric acid, urea, and serum protein compared to the untreated group. The decrease in these biochemical indices recorded in *Launaea taraxacifolia*-treated groups in this study shows that the plant is possibly reversing liver and kidney cell damage, which might have been caused by hyperlipidemia.

Creatine kinase is an important enzyme in tissues. Clinically, creatine kinase is assayed in a blood test as a marker of damage to CK-rich tissue, as in myocardial infarction (heart attack). Studies have shown that hyperlipidemia reduces the level of CK and therefore impairs its function in the heart[29].

In this study, *L. taraxacifolia* raises the level of creatine kinase in groups fed with the plant, with no significant difference from the control group, compared with the untreated group with reduced CK activity, which might have been impaired due to hyperlipidemia. Thus, *L. taraxacifolia* can be used to elevate the level of creatine kinase when it is reduced in hyperlipidemic conditions, preventing the heart from coronary heart diseases such as atherosclerosis.

Conclusion

This study shows that *launaea taraxacifolia* leaf-based diet at the inclusion levels investigated can reverse the distortions in the concentrations/activities of biomarkers and enzymes of tissues caused by hyperlipidemia, which was induced by a high-fat diet.

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Ethical Approvals

The authors adhered strictly to the regulations governing the use of laboratory animals laid out by the Committee on Ethics for Medical and Scientific Research, University of Ilorin, Nigeria. Additionally, the accepted, internationally acknowledged ideals for the use and care of laboratory animals, as outlined in the Canadian Council on Animal Care Guidelines and Protocol Review, were also put into effect.

Competing Interest

The authors declare that they have no conflict of interest.

References

1. Kaesancini AY, Krauss RM. Cardiovascular disease and hyperlipidemia: current topics of lipid dynamics. Curr Top Lipid Dyn. 1994;5:249–251.

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2. Beltowski J, Wojcicka G, Jamroz-Wisniewska A. Adverse effects of statins—mechanisms and consequences. Curr Drug Saf. 2009;4(3):209–28.
3. Laleye FO, Mensah S, Assogbadjo AE, Ahissou H. Diversity, knowledge, and use of plants in traditional treatment of diabetes in the Republic of Benin. Ethnobot Res Appl. 2015;14:231–258.
4. Adebisi AA. Population of neglected indigenous leafy vegetables among the Yoruba tribe of South West Nigeria. CERNARD Dev Ser. 2000;06:86.
5. Koukoui O, Senou M, Agbangnan P. Effective in vivo cholesterol and triglycerides lowering activities of hydroethanolic extract of Launaea taraxacifolia leaves. Int J Pharm Sci Res. 2017;8(5):2040.
6. Oladiji AT, Jacob TO, Yakubu MT. Anti-anaemic potentials of aqueous extract of Sorghum bicolor (L.) Moench stem bark in rats. J Ethnopharmacol. 2007;111(3):651–656.
7. Yakubu MT, Akanji MA, Oladiji AT. Alterations in serum lipid profile of male rats by oral administration of aqueous extract of Fadogia agrestis stem. Res J Med Plant. 2008;2:66–73.
8. Mwale M, Mupangwa JF, Mapiye C, Saina H, Chimvuramahwe J. Growth performance of guinea fowl keets fed graded levels of baobab seed cake diets. Int J Poult Sci. 2008;7:429–432.
9. Bernardis LL, Patterson BD. Correlation between 'Lee index' and carcass fat content in weanling and adult female rats with hypothalamic lesions. J Endocrinol. 1968;40:527–528.
10. Novelli ELB, Diniz YS, Galhardi CM, Ebaid GMX, Rodrigues GH, Mani F, Fernandes AAH, Cicogna AC, Novelli FJLVB. Anthropometrical parameters and markers of obesity in rats. Lab Anim. 2007;41(1):111–119.
11. Wright PJ, Leatherwood PD, Plummer DT. Enzymes in rats: alkaline phosphatase. Enzymologia. 1972;42:317–327.
12. Reitman S, Frankel S. A colorimetric method for determination of serum glutamate-oxaloacetate and pyruvate transaminase. Am J Clin Pathol. 1957;28:56–59.
13. Weisshaar TA. An investigation of supersonic aeroelastic characteristics of oblique winged aircraft. J Optim. 1975;4(3):141–157.
14. Szasz G. Methods of enzymatic analysis. 1969;2:2715.
15. Doumas BT, Watson WA, Biggs HG. Albumin standard and measurement of serum albumin with bromocresol green. Clin Chim Acta. 1971;31:87–92.
16. Jendrassik G, Grof A. Quantitative in vitro determination of total and direct bilirubin in serum or plasma. Clin Chem. 1938;27:102–105.
17. Duncan BD. Multiple range tests for correlated and heteroscedastic means. Biometrics. 1957;13:359–364.
18. Arulselvan P, Umamaheswari A, Fakurazi S. Therapeutic approaches for diabetes with natural antioxidants. In: Medicinal plants as antioxidant agents: understanding their mechanism of action and therapeutic efficacy. Kerala: Research Signpost; 2012. p. 237–266.
19. Aboderin FI, Olajide JS, Adesiyan AA. Toxicity effect of Launaea taraxacifolia aqueous extract on vital organs of albino rat. Int J Biochem Mol Biol. 2017;2(2):47–50.
20. Koukoui O, Senou M, Agbangnan P. Effective in vivo cholesterol and triglycerides lowering activities of hydroethanolic extract of Launaea taraxacifolia leaves. Int J Pharm Sci Res. 2017;8(5):2040.
21. Dairo JO, Ukpanukpong RU, Uyabeme RN. Phytochemical screening, proximate analysis and acute toxicity study of Launaea taraxacifolia ethanolic extract on albino rats. Int J Sci Technol. 2015;3(6):199–202.
22. Kuatsienu LE, Ansah C, Adinortey MB. Toxicological evaluation and protective effect of ethanolic leaf extract of Launaea taraxacifolia on gentamicin-induced rat kidney injury. Asian Pac J Trop Biomed. 2017;7(7):640–646.
23. Kuatsienu LE, Ansah C, Woode E. Safety assessment of the ethanolic leaf extract of Launaea taraxacifolia (Willd) of the family Asteraceae in rodents [master's thesis]. Kumasi (Ghana): Kwame Nkrumah Univ Sci Technol; 2012.
24. Tokinaga K, Oeda T, Suzuki Y, Matsushima Y. HMG-CoA reductase inhibitors (statins) might cause high elevations of creatine phosphokinase in patients with unnoticed hypothyroidism. Endocr J. 2006;53:401–405.
25. Noor R, Mittal S, Iqbal J. Superoxide dismutase – applications and relevance to human diseases. Med Sci Monit. 2002;8:210–215.
26. Schrier RW. Blood urea nitrogen and serum creatinine: not married in heart failure. Circulation: Heart Failure. 2008 May 1;1(1):2-5.
27. Jose J. Statins and its hepatic effects: newer data, implications, and changing recommendations. J Pharm Bioallied Sci. 2016;8:23–28.
28. Sodipo OA, Abdulrahman FI, Sandabe UK. Biochemical kidney function with aqueous fruit extract of Solanum macrocarpum Linn. in albino rats chronically administered Triton-X to induce hyperlipidemia. J Med Med Sci. 2012;3(2):93–98.
29. Yang SH, Du Y, Li XL, Zhang Y, Li S, Xu RX. Triglyceride to high-density lipoprotein cholesterol ratio and cardiovascular events in diabetics with coronary artery disease. Am J Med Sci. 2017;354:117–124.

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الملخص

بحثت الدراسة في آثار نظام غذائي قائم على أوراقLaunaea taraxacifolia ، بمستويات تضمين تتراوح بين 6.25% و25%، على إنزيمات ومؤشرات حيوية مختارة لأنسجة مختارة من فئران مصابة بفرط شحميات الدم الناتج عن نظام غذائي غني بالدهون. قُسِّمت 36 أنثى فأر، بوزن 165.82 ± 2.10 غرام، إلى مجموعتين: أ (6) و ب (30). أُصيبت حيوانات المجموعة ب بفرط شحميات الدم عن طريق تناول نظام غذائي غني بالدهون لمدة ستة أسابيع، ثم أُعيد توزيعها إلى ست مجموعات: غير معالجة، ومعالجة بالأتورفاستاتين، ومعالجة بنظام غذائي قائم على أوراق Launaea taraxacifolia(بنسب تضمين 6.25%، و12.5%، و25%)، واستمرت على نظامها الغذائي لمدة ستة أسابيع. تم تحديد نشاط/تركيزات الإنزيمات/المؤشرات الحيوية في الأنسجة المختارة: الكبد (نازعة هيدروجين اللاكتات، ألانين أسبارتات أمينو ترانسفيراز، غاما غلوتاميل ترانسفيراز)، القلب (فوسفاتاز حمضي، كرياتينين كيناز)، المصل (نازعة هيدروجين اللاكتات، فوسفاتاز قلوي وحمضي، ألانين، أسبارتات أمينو ترانسفيراز، غاما غلوتاميل ترانسفيراز، ألبومين، بيليروبين، يوريا، حمض اليوريك، وكرياتينين) باستخدام الطرق القياسية. أظهرت النتائج أن الحيوانات المعالجة بأوراق لاونيا تاراكساسيفوليا أظهرت انخفاضًا ملحوظًا في الكرياتينين، وحمض اليوريك، واليوريا، وبروتين المصل، بينما أشارت الزيادة الملحوظة في كيناز الكرياتينين إلى انخفاض في حالة فرط شحميات الدم. بشكل عام، تشير نتائج الدراسة إلى أن أوراق لاونيا تاراكساسيفوليا قادرة على عكس فرط شحميات الدم.

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