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Evaluation of the Anti-Obesity Activity of *Evolvulus nummularius* and *Jatropha integerrima* Leaf Extracts in HFD-Induced Obese Mice

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Abstract

The study conducted in this particular research involved the use of a model involving obesity caused by a High Fat Diet (HFD) in female mice of the species Swiss albino to investigate the possible anti-obesity effects of ethanolic leaves extract from two plants, namely *Evolvulus nummularius* and *Jatropha integerrima*. The HFD diet was administered via oral route in doses of 10 mg/kg body weight for 28 consecutive days to induce experimental obesity. In this particular research, the standard reference was orlistat at a 10 mg/kg dose, whereas the plant extract doses were at 200 mg/kg and 400 mg/kg body weight. The following variables were recorded on a weekly basis throughout the duration of this experiment: body weight gain, BMI, and food consumption. Moreover, other serum biochemical markers such as total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) were determined at the end of the treatment duration. Compared to the HFD-treated control group, there was a statistically significant reduction in body weight gain, BMI, and fat deposition with increased HDL-C as well as reduced TC, TG, and LDL-C, among other benefits associated with the administration of both plant extracts, especially at a dose of 400 mg/kg. Furthermore, histological examination confirmed the presence of reduced adipocyte hypertrophy among the treated mice. Bioactive phytochemicals such as flavonoids, saponins, and phenolics, which affect lipid metabolism and inhibit adipogenesis, could be the cause of the benefits obtained. All of these results point to the chosen plant extracts' potential as natural therapeutic agents for the treatment of hormone-induced obesity.

Keywords: Evolvulus nummularius, Jatropha integerrima, HFD, Body mass index (BMI), Lipid metabolism

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1.1 Obesity is a significant risk factor for diabetes, cardiovascular disease, and metabolic syndrome:

Currently, obesity represents a significant public health challenge, with approximately 1.9 billion adults aged 18 and older worldwide classified as overweight, of which around 600 million are considered clinically obese [1]. Obesity is now a major risk factor, especially for youngsters, due to changes in lifestyle habits and the intake of high-calorie meals [2][3]. There are several pharmaceuticals available as anti-obesity drugs, but they may have dangerous adverse effects. As a result, many Asian nations have used natural items to treat obesity [4]. Natural products have a lot of potential as safe and efficient alternatives for creating anti-obesity drugs, but their use in managing obesity is still mainly unexplored [5].

1.2 Limitations of current synthetic anti-obesity drugs:

Existing synthetic anti-obesity medications have several notable drawbacks. Medications like appetite suppressants and lipase inhibitors will usually lead to minimal weight loss, and in many cases, they might not succeed in maintaining efficacy in the long run. Some of the side effects associated with these medications include problems with the gastrointestinal tract, heart complications, and Psychiatric issues, which could lower patient compliance. Individual differences could also limit the efficiency of the treatment process. In some instances, some drugs could cause weight gain after treatment is stopped. Financial barriers and lack of availability also contribute to the challenges in implementing these drugs [6].

1.3 Traditional medicinal plants as alternative therapies:

Natural medicinal plants are now gaining attention as an alternative treatment for obesity because of their inherent nature and multiple targets. There are several bioactive compounds found in plants that have the ability to regulate metabolism, inhibit fat storage, and normalize lipids, thus leading to fewer side effects than chemical drugs [7].

1.3 Limited comparative studies on *Evolvulus nummularius* and *Jatropha integerrima*:

While there is an increasing trend of plant-based treatment, the majority of scientific research has been done with the use of specific medicinal plants without making many comparisons between their effectiveness. This shows that a knowledge gap exists when it comes to the comparison between *Evolvulus nummularius* and *Jatropha integerrima* [8].

1.4 Botanical Profile and Rationale for Plant Selection

The prostrate, creeping herb *Evolvulus nummularius* (family: Convolvulaceae) is found throughout tropical areas, including India. Traditionally, this plant has been applied in herbal treatments for conditions such as burns, scabies, injuries, and helminthic infections. The antioxidant, antibacterial, and anthelmintic activities of the plant are believed to be due to its chemical composition, which includes biologically active compounds like flavonoids, tannins, triterpenoids, and sterols such as β-sitosterol, based on phytochemical studies. Metabolic regulation is another activity that is associated with the biologically active compounds [9][10].

Table 1. Pharmacological and biological studies of *Evolvulus nummularius*

S. No	Pharmacological Property	Key Findings
1.	Traditional Medicine Uses	Used for wounds, cuts, scorpion stings, hysteria, and scabies; sedative, anthelmintic, wound recovery, hepatoprotective.
2.	Antioxidant Activity [13]	Methanol extract shows radical scavenging activity (IC50 = 350 µg/ml); attributed to tannins, flavonoids, triterpenoids.
3.	Antibacterial Activity [13]	The methanolic extract demonstrated antibacterial activity against Escherichia coli (MIC = 12.5 mg/ml) and Bacillus subtilis (MIC = 3.125 mg/ml). In contrast, Staphylococcus aureus, Klebsiella pneumoniae, and Pseudomonas aeruginosa showed resistance to the extract.
4.	Anticestodial Efficacy & GC-MS [14]	In vitro and in vivo reduction of *H. diminuta* eggs and worms (71–80%); AChE activity reduced 55.73%; GC-MS revealed bioactive compounds.
5.	In vitro Toxicity [15]	Crude methanolic extract is poisonous to human RBCs and girl genital epithelial cells; caution for vaginal use.
6.	CNS & Behavioral Activity [16]	Increased sleep duration and latency; reduced exploratory behavior, locomotor activity, and muscle coordination in rats; CNS depressant at 200–400 mg/kg
7.	Anti-NAFLD Activity [17]	Methanolic leaf extract prevented high-fat diet-induced fatty liver in rats; improved HDL, reduced liver weight, triglycerides, TC, LDL, VLDL, MDA, and GPX1.
8.	Anti-pyretic & Wound Healing [18]	Hydroalcoholic leaf extract reduced yeast-induced fever and promoted wound healing; comparable to standard drugs.

9.	Anti-proliferative Activity [19]	Methanol extracts inhibited doxorubicin-resistant human leukemia cells (CEM/ADR5000) at 25 µg/ml, 99.32% effect.

It is also commonly called peregrina. It belongs to the family Euphorbiaceae and is a beautiful shrub common in the tropics. The plants belonging to the genus Jatropha contain a high amount of diterpenoids, flavonoids, alkaloids, and phenolic compounds that are known for their medicinal properties. These compounds have been found to have antilipidemic, anti-inflammatory, and antioxidant properties. These characteristics suggest a possible function in avoiding adipogenesis and regulating lipid metabolism, which could support anti-obesity benefits [11][12].

1.4 Pharmacological and biological studies of *Evolvulus nummularius* and *Jatropha. integerrima*

Table 2: Pharmacological and biological studies of *Jatropha. Integerrima*

S.No	Pharmacological Property	Key Findings
1.	Antimicrobial Studies [20]	Critical oils from leaves and seeds analyzed using GC and GC-MS confirmed variation in composition. Leaf oil especially includes pentadecanal (32.4 %), 1,8-cineole (11.2%), and β-ionone (10.8%). Seed oil contains aliphatic hydrocarbons, including pentacosane (13.6%), hexacosane (13.3 %), octacosane (12.3%), and heptacosane (10.1%).
2.	Anti-inflammatory Activity [21]	Leaf extract (JILE) tested in rat paw edema model. Oral doses (200 & 400 mg/kg) and topical creams (2.5–10%) were used. Maximum edema reduction (63.09%) observed at 400 mg/kg, higher than indomethacin (60.43%).
3.	Antibacterial & Antioxidant Activity [22]	Flower extract used to synthesize silver nanoparticles (JIF-AgNPs). Confirmed antibacterial pastime (properly diffusion & microdilution techniques) and antioxidant results. UV–Vis peak at 422 nm; FTIR showed involvement of phenols and amino acids in nanoparticle stabilization.
4.	Dengue Vector Control & Cytotoxicity [23]	Green synthesis of combinational silver nanoparticles demonstrated enhanced bioactivity for dengue vector control and cytotoxicity assessment. First report using this combinational nanoparticle approach.
5.	Thioredoxin Reductase Inhibition [24]	9 new diterpenoids (jatrointelones A–I) and 12 recognized compounds isolated. Confirmed inhibitory int erest in opposition to thioredoxin reductase (TrxR), a goal for most cancers' chemotherapy and redox regulation.

6.	Anti-influenza & Cytotoxic Activity [25]	Extracts inhibit the hemagglutinin protein, preventing virus adsorption. Effective against influenza A (H1N1) with low toxicity, suggesting potential as broad-spectrum antiviral agents.
7.	Hepatoprotective Activity [26]	Methanolic leaf extract protects against CCl_4-triggered liver harm in rats. Reduces ALT & AST tiers, improves antioxidant reputation, and minimizes tissue damage.

1.6 Aim and Objectives of the Study

Based on the foregoing review, the present study was designed to (i) to assess the anti-obesity potential of ethanolic leaf extracts of Jatropha integerrima and *Evolvulus nummularius* in obese mice produced by a high-fat diet. (ii) to use a high-fat diet to make mice obese. (iii) to make ethanolic leaf extracts from Jatropha integerrima and *Evolvulus nummularius*. (iv) to evaluate how the extracts affected the obese mice's body weight and fat accumulation. (v) to assess biochemical indicators of obesity, including liver enzymes, glucose, and lipid profiles. (vi) to evaluate both plant extracts' anti-obesity effectiveness in comparison to the control group.

2. Materials and Methods

2.1 Plant Collection and Authentication:

The aerial parts (leaves) of *Evolvulus nummularius* & *Jatropha integerrima* were collected from the nursery Greater Noida, Uttar Pradesh, India. During [January/2025]. The collection was done in the early morning hours to avoid degradation of labile phytoconstituents. During collection, fresh and healthy plants were chosen, avoiding diseased, insect-damaged or stressed specimens. The collected plant material was cleaned of extraneous matter (such as dust, adhering soil or foreign vegetation) and transported to the laboratory for further processing. Shade-drying was carried out to preserve phytochemical integrity and avoid thermal degradation.

2.2 Preparation of Extract

The dried leaves of *Evolvulus nummularius* and *Jatropha integerrima* were first washed thoroughly and shade-dried to remove moisture. The dried leaves were then powdered using a mechanical grinder. The powdered plant material was subjected to Soxhlet extraction using ethanol as the solvent. During the extraction process, ethanol continuously circulated through the plant powder to ensure maximum extraction of bioactive compounds. After completion of the extraction, the ethanolic extract was filtered using filter paper to remove insoluble residues. The filtrate was then concentrated under reduced pressure using a rotary evaporator to obtain a semi-solid crude extract. Finally, the concentrated extract was stored in airtight containers at 4°C until further pharmacological and biochemical studies were carried out. [27][28].

2.3 Preparation of dosing suspension

The required amount of dried plant extract was precisely measured and dispersed in distilled water containing 1% carboxymethyl cellulose (CMC) to obtain the desired dosing solution. The preparation was made fresh prior to each administration and mixed thoroughly to ensure homogeneity. The formulated extract was orally administered to the experimental animals at the predetermined dose based on their body weight.”

2.4 Experimental Animals

For the study, 42 Swiss albino mice weighing between 20 and 25 grams each were obtained and kept under typical laboratory settings (22 ± 2°C, 55–65% humidity, and a 12-hour light/dark cycle). Water and a regular pellet feed were freely available to the animals [27]. The Institutional Animal Ethics Committee approved all experimental methods, which were conducted in accordance with institutional ethical guidelines. (IPSR/IAEC/25/04)

2.5 Induction of obesity

The 60% kcal fat diet was given to the HFD mice. Oral HFD at a dose of 10 mg/kg of body weight once daily for 28 days was used to experimentally create obesity. Only vehicles were given to normal control animals [29][30] [31][32].

Table 3: Preparation of experimental High-Fat Diet (HFD) [34]

Constituents	Quantity (g/kg diet)
Lard	245g
Soybean oil	25g
Casein	200g
Maltodextrin	125g
Sucrose	68.8g
Corn starch	72.8g
Cellulose	50g
Mineral mix	10g
Vitamin mix	10g
l-cystine	3g
Choline bitartrate	2g

2.6 Experimental Design

The animals were divided into seven groups at random. (n = 6):
Group I: Control (vehicle only)
Group II: Negative control (Receive feed on high-fat diet (HFD)
Group III: HFD combined with Orlistat (10 mg/kg, administered orally)
Group IV: HFD combined with *E. nummularius* (200 mg/kg, administered orally)
Group V: HFD combined with *E. nummularius* (400 mg/kg, administered orally)
Group VI: HFD combined with *J. integerrima* (200 mg/kg, administered orally)
Group VII: HFD combined with *J. integerrima* (400 mg/kg, administered orally)

Obesity was induced through the oral administration of HFD at a dosage of 10 mg/kg of body weight, administered once daily for a duration of 28 days. The standard drug and plant extracts were given orally in conjunction with HFD treatment for the entire 28-day period. The normal control group received a vehicle only.

The doses of plant extracts selected were 200 mg/kg and 400 mg/kg based on preliminary experiments and prior pharmacological studies of herbal extracts in experimental models. The experimental design, including the use of a progesterone-induced obesity model, standard drug

comparison with orlistat, and multiple dose levels of plant extracts, follows established protocols for evaluating anti-obesity activity in rodents [29] [33].

BMI Calculation:

The Body Mass Index (BMI) was determined using the Lee index formula.

$$BMI = \frac{(Body\ weight)\text{^}(1/3)}{Nasal-anal\ Length} \times 1000 \quad (1)$$

Animals with a BMI ≥ 310 were considered obese [33].

2.7 Statistical Analysis:

Results were presented in mean ± SEM (n=6). Statistical analysis was done using one-way ANOVA, followed by post hoc analysis using Tukey's multiple comparison test. Differences between means were taken to be significant at $p<0.05$.

3. Results and Discussion:

3.1 Effects of both Leaf Extracts on Body Mass Index s in HFD-Induced Obese Mice:

The impact of ethanolic leaf extracts from *Evolvulus nummularius* and *Jatropha integerrima* on body mass index (BMI) in mice induced to obesity through HFD is summarized in Table 4. BMI results following administration of 200 mg/kg of E. nummularius were comparable to the normal control, although there were significant decreases in BMI compared to the HFD-treated group on days 7, 14, 21, and 28. In contrast, this dose was relatively less effective than orlistat, where BMI was significantly higher in the extract-treated group than in the orlistat-treated group starting from day 14 onwards. The effect of 400 mg/kg of E. nummularius led to a significant decrease in BMI from day 14, where BMI reached levels comparable to the orlistat-treated group, while significantly different from the negative control. For J. integerrima, the dose-dependent effects on anti-obesity were evident. The 200 mg/kg dose of the plant led to insignificant BMI decreases except on day 28, compared to the HFD-treated group. On the other hand, the 400 mg/kg dose led to significant reductions in BMI on days 7, 21, and 28, which were comparable but significantly lower compared to the negative control group. However, BMI levels in the group administered with the 400 mg/kg dose were insignificantly higher than in the orlistat-treated group on days 14, 21, and 28.

Table 4: Impact of Leaf Extracts on Body Mass Index in Mice Induced with Obesity by Progesterone

Treatment	Time [days]				
	0	7	14	21	28
Control group	297.37 ± 2.01	301.38 ± 1.95	302.31 ± 1.64	302.72 ± 1.10	303.91 ± 0.76
Negative control (HFD)	304.41 ± 1.48	312.48 ± 2.34	313.97 ± 1.94	316.41 ± 1.84	317.49 ± 1.79
Orlistat (10 mg/kg body weight)	302.16 ± 1.02	295.70 ± 2.06	292.49 ± 1.91	290.48 ± 1.69	288.40 ± 1.97

E. Nummularius (200 mg/kg body weight)	299.84 ± 0.91	302.69 ± 0.56	305.53 ± 0.99	305.53 ± 2.66	307.89 ± 1.99
E.Nummularius (400 mg/kg body weight)	301.84 ± 1.13	296.34 ± 2.93	291.60 ± 2.49	291.90 ± 3.35	290.11 ± 2.44
J.integerrima (200 mg/kg body weight)	300.01 ± 0.43	308.11 ± 1.55	308.56 ± 1.62	308.23 ± 2.58	308.39 ± 1.10
J. integerrima (400 mg/kg body weight)	301.08 ± 1.32	303.21 ± 2.28	305.47 ± 3.52	300.95 ± 2.80	300.55 ± 3.66

"Values are presented as Mean ± SEM for five animals per group. Statistical comparisons were conducted using one-way ANOVA, followed by Tukey's post hoc test. Within each time point, values with different superscript letters indicate significant differences at $p < 0.05$."

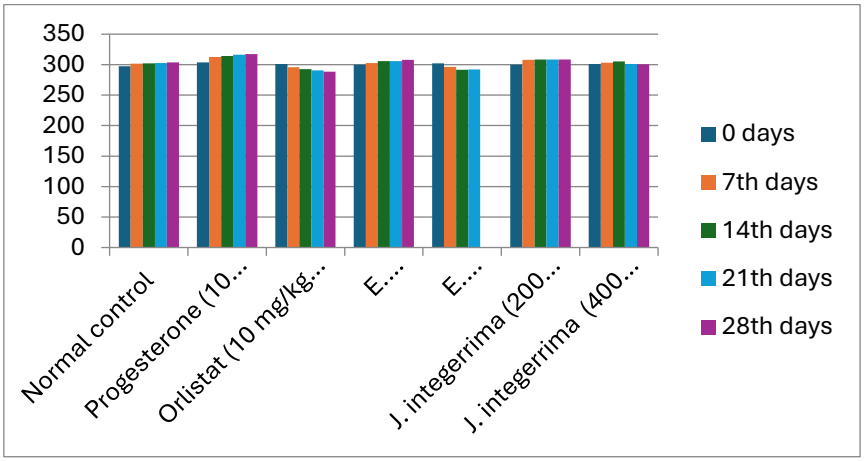

Figure 1: Body Mass Index in Mice

3.2 Effects of both Leaf Extracts on Glucose Levels and Lipid Profiles in HFD-Induced Obese Mice:

3.2.1 *Evolvulus nummularius*:

When compared to the normal control, mice at 200 mg/kg body weight showed no statistically significant changes in glucose or lipid indices. There were slight, non-significant decreases in glucose, TG, TC, and LDL-C compared to the HFD-treated negative control. While total cholesterol (TC) and high-density lipoprotein cholesterol (HDL-C) levels were comparable between the groups, there was a non-significant increase in glucose, triglycerides (TG), and low-density lipoprotein cholesterol (LDL-C) when compared to positive controls treated with orlistat.

The treatment produced small, non-significant increases in glucose and lipid parameters when compared to normal controls and non-significant decreases when compared to the negative control at a dosage of 400 mg/kg body weight. TG, TC, and HDL-C values were not substantially different from those in the orlistat group, indicating similar effectiveness in modifying lipid profiles.

3.2.*2 Jatropha Integerrima*:

At a dose of 200 mg/kg body weight, mice showed only slight, non-significant decreases in glucose, total cholesterol (TC), and low-density lipoprotein cholesterol (LDL-C) in comparison to the negative control, with no discernible changes in glucose or lipid parameters. There were minor, non-significant increases in glucose and triglycerides (TG) when compared to mice treated with orlistat. At a dosage of 400 mg/kg body weight, there were slight, non-significant increases in lipid and glucose parameters when compared to normal controls and non-significant decreases when compared to the negative control. High-density lipoprotein cholesterol (HDL-C), TG, and TC levels were equivalent to those in the orlistat group, indicating similar lipid-lowering effects. Overall, these results suggest that both *E. nummularius* and *J. integerrima* effectively modulate glucose and Lipid profiles in mice induced to be obese by HFD, revealing that the higher dose (400 mg/kg body weight) exhibited effects similar to those of orlistat.

Table 5: Impact of leaf extracts on lipid profile and glucose levels in mice induced with obesity by HFD:

Treatment	Glucose	TG	TC	HDL-C	LDL-C
Control group	5.11 ± 0.27	0.74 ± 0.11	1.08 ± 0.16	0.52 ± 0.19	
Negative control (HFD)	6.58 ± 0.28	1.00 ± 0.2	1.78 ± 0.36	0.54 ± 0.22	0.40 ± 0.08
Orlistat (10 mg/kg bw)	5.54 ± 0.30	0.92 ± 0.08	1.50 ± 0.15	0.60 ± 0.07	0.42 ± 0.15
E. Nummularius (200 mg/kg bw)	6.32 ± 0.76	0.96 ± 0.07	1.50 ± 0.09	0.60 ± 0.07	0.54 ± 0.14
E. Nummularius (400 mg/kg bw)	5.20 ± 0.22	0.72 ± 0.10	1.78 ± 0.22	0.74 ± 0.24	0.40 ± 0.04
J. integerrima (200 mg/kg bw)	5.80 ± 0.19	1.00 ± 0.06	1.08 ± 0.08	0.58 ± 0.16	0.22 ± 0.03
J. integerrima (400 mg/kg bw)	5.78 ± 0.97	0.94 ± 0.04	1.24 ± 0.16	0.54 ± 0.09	0.28 ± 0.02

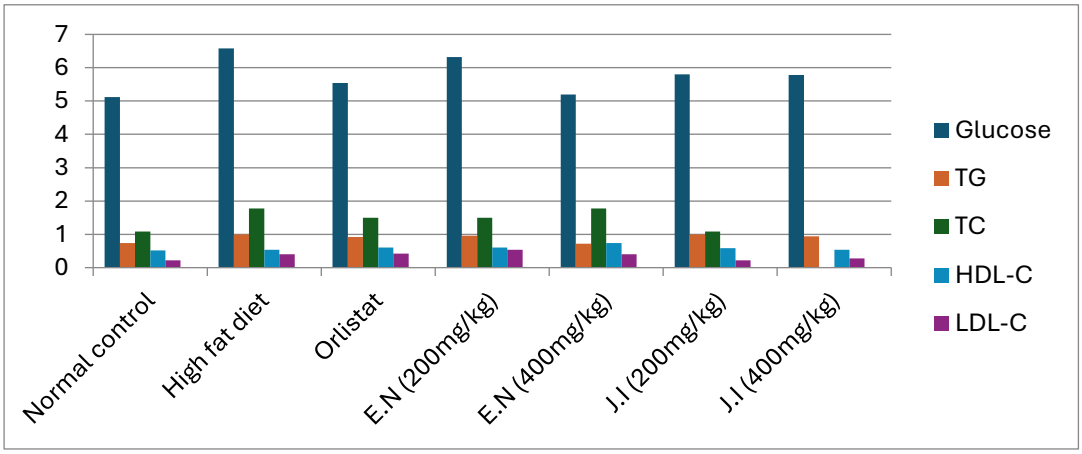

Figure 2: Lipid profile and glucose levels in mice

3.3 Effects of both leaf extracts on dietary habits in obese mice fed a high-fat diet:
During the experimental period, the average daily food intake of mice in each group was recorded. The normal control group maintained consistent consumption of a standard diet. The progesterone-treated negative control group exhibited slightly higher food intake than the normal control, contributing to increased body weight. Although the orlistat-treated positive control group had lower body weight than the negative control, no significant reduction in food intake was detected, suggesting that weight changes were primarily due to metabolic effects. When compared to the negative control, treatment with *Evolvulus nummularius* and *Jatropha integerrima* extracts at 200 and 400 mg/kg body wt. did not significantly change food consumption. Overall, compared to the progesterone-induced fat mice, the mice in the normal control, plant extract-treated, and orlistat-treated groups ate more.

Table 6: Effect of *J. integerrima* and *E. nummularius* ethanolic leaf extracts Daily food intake

Group	Average daily food intake
Normal Control	4.5±0.2
HFD control	5.0±0.3
Standard Group (Orlistat)	4.9±0.2
E. Nummularius (low dose)	4.8±0.3
E. Nummularius (high dose)	4.6±0.2
J. Integerrima (low dose)	4.8±0.3
J. Integerrima (high dose)	4.7±0.3

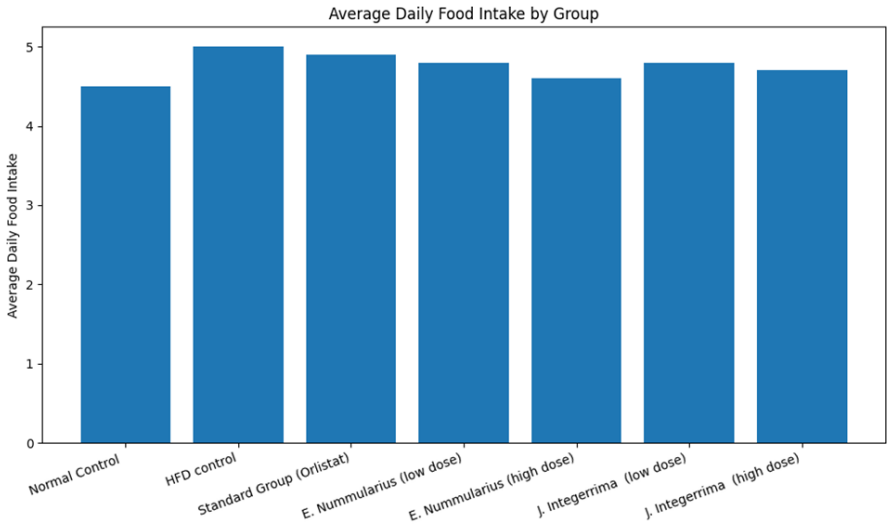

Figure 3: Average daily food intake

Excessive fat build up, increased adipocytes, and dysregulated lipid metabolism are the hallmarks of obesity, a complex metabolic illness that can lead to comorbidities including type 2 diabetes, cardiovascular disease, and a shorter life expectancy. Using orlistat as the standard comparator, this study assessed the anti-obesity effects of ethanolic leaf extracts from *Evolvulus nummularius* and *Jatropha integerrima* in a mouse model of obesity caused by a high-fat diet.

HFD administration significantly increased body mass index (BMI) in female Swiss albino mice, indicating successful induction of obesity. Both plant extracts produced dose-dependent reductions in BMI, body weight, and lipid accumulation. Treatment with *E. nummularius* at 400 mg/kg bw exerted the most pronounced effect, lowering BMI to levels comparable with orlistat-treated mice and significantly reducing BMI relative to the HFD control. Although to a lesser degree, the 200 mg/kg bw dose also decreased BMI, indicating a distinct dose-response relationship. Similar to *E. nummularius, J. integerrima* extracts showed dosage-dependent anti-obesity benefits, with the 400 mg/kg bw dose considerably improving BMI and lipid profiles.

It is suggested that *Evolvulus nummularius* and *Jatropha integerrima* may exert their therapeutic effects via metabolic modulation and not via appetite suppression since the reduction in body mass index and obesity among the test animals was not accompanied by any reduction in food consumption. The observation is in line with studies indicating that plant extracts containing phytochemical compounds like flavonoids, terpenoids, and phenols have the ability to increase metabolic efficiency, reduce adipogenesis, and promote lipid metabolism. This was confirmed by histopathological examinations, where a reduction in the size of adipocytes and lipid deposition was observed, implying a reversal of obesity-induced cellular changes.

The two plant extracts exhibited almost equal efficiency when administered at higher concentrations, compared with the anti-obesity drug Orlistat, which acts by blocking pancreatic lipase and regulating appetite-inducing neurotransmitters. Notably, the main drawbacks of synthetic anti-obesity medications are addressed by herbal formulations, which are frequently linked to fewer side effects and lower costs.
The higher amount of phytoactive components of plants that have a synergistic effect on the oxidation stress pathway, adipogenesis, and lipogenesis could be the reason for the enhanced efficiency of *E. nummularius*. In spite of the delayed onset of its effects, *J. integerrima* was highly effective in preventing obesity, with a significant reduction of BMI observed from the third week.

4. Conclusion

From the current study, it can be concluded that ethanolic leaf extracts from *Jatropha integerrima* and *Evolvulus nummularius* possess remarkable anti-obesity activities in female Swiss albino mice on a high-fat diet. Both plant extracts improved blood lipid parameters, such as decreased TC, TG, and LDL-C concentration along with increased HDL-C level, decreased body weight gain, body mass index (BMI), fat deposition, and reduced food intake. The dose-dependent anti-obesity activity is evident through enhanced anti-obesity activity at the highest dose level of 400 mg/kg from all other doses. The present study demonstrates the similarity of anti-obesity activities from the two plant extracts compared to the standard anti-obesity drug Orlistat at the dose of 10 mg/kg. *Evolvulus nummularius* was found to have promising anti-BMI and body weight-gaining activities, while *Jatropha integerrima* possessed superior anti-lipidemia and adipocyte activities. Histopathological analysis supports the role of both plant extracts against HFD-induced adipocyte hypertrophy.
The bioactive compounds, such as flavonoids, saponins, and phenolic compounds that are known to regulate lipid metabolism, inhibit fat formation, and enhance antioxidant protection mechanisms, could be behind their potential to curb obesity. Overall, the results indicate that both plant extracts may be useful, safe, and affordable substitutes for traditional anti-obesity treatments. However, additional molecular, toxicological, and clinical research is needed to confirm their safety, mode of action, and translational relevance in the treatment of human obesity.

Conflicts of Interest: There are no conflicts of interest, according to the authors.

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Author Contributions: Sarika Chaturvedi contributed to conceptualization (lead), methodology (lead), investigation (lead), writing of the original draft (lead), and supervision. Dr. Sushila Kaura was responsible for formal analysis (lead), writing – review & editing (lead), and visualization (supporting).

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