Contents lists available at UGC-CARE

International Journal of Pharmaceutical Sciences and Drug Research

[ISSN: 0975-248X; CODEN (USA): IJPSPP]

journal home page : http://ijpsdronline.com/index.php/journal

Research Article

Multi-pathway Antiobesity Effects of a Standardized Ginger-Garlic-Licorice-Gurmar Polyherbal Formulation in Diet-Induced Obesity

Gunjansing Rajput*, Devendra Shirode, Aishwarya Patil, Avinash Gunjal, Prasad Bairagi, Vaishnavi Patil, Manswi Deore

Department of Pharmacology, Dr. D. Y. Patil College of Pharmacy, Akurdi, Pune 411044, Maharashtra, India.

ARTICLE INFO

Article history:

Received: 12 August, 2025

Revised: 06 November, 2025

Accepted: 28 October, 2025

Published: 30 November, 2025

Keywords:

High-fat diet, Serum lipids, Hepatotoxicity, Antiobesity, Polyherbal formulation.

DOI:

10.25004/IJPSDR.2025.170603

ABSTRACT

Obesity affects over 650 million adults worldwide, and current pharmacological treatments often have limited efficacy and adverse effects, highlighting the need for safer alternatives. Polyherbal formulations based on traditional medicines offer synergistic therapeutic benefits with reduced side effects. The present study developed and evaluated a polyherbal formulation (PHF) comprising *Zingiber officinale, Allium sativum, Glycyrrhiza glabra,* and *Gymnema sylvestre*. This formulation was prepared by using hydroalcoholic extracts obtained through maceration and was evaluated for various phytochemical studies, organoleptic parameters, etc. Following the confirmation of quality control parameters, we conducted an acute oral toxicity test in accordance with OECD guidelines. Based on this evaluation, we conclude that this polyherbal elixir formulation will be evaluated for a high-fat diet model for an antiobesity study. HFD was given to all animals (excluding the normal control) to induce obesity. PHF treatment produced a dose-dependent reduction in body weight and serum lipid parameters while normalizing liver enzyme levels compared to the HFD control group. Histopathological analysis revealed restoration of hepatic and adipose tissue architecture, supporting the biochemical findings. The observed effects suggest that the formulation exerts its antiobesity action through modulation of lipid metabolism, inhibition of adipogenesis, and enhancement of fatty acid oxidation.

INTRODUCTION

Obesity, characterized by excessive accumulation of adipose tissue, is a multifactorial chronic disorder that has reached epidemic proportions worldwide. Its prevalence has increased sharply in recent decades, largely due to unhealthy dietary habits such as the consumption of high-fat and fast foods. These diets contribute to the excessive production of very low-density lipoproteins (VLDL), leading to elevated levels of low-density lipoproteins (LDL). In the absence of sufficient high-density lipoproteins (HDL), LDL tends to adhere to the endothelial lining of blood vessels, impairing normal blood flow and increasing the risk of coronary heart disease (CHD). [1]

A drop in the serum cholesterol levels has been shown to significantly decrease the incidence of CHD. Although allopathic hypolipidemic agents such as statins, fibrates, niacin, and resins are widely used, their long-term use is associated with adverse effects, including hyperuricemia, nausea, myopathy, diarrhea, gastric irritation, flushing, xerosis, and hepatic dysfunction. Drugs like ezetimibe (Zetia) and orlistat (Xenical) are also available in the market; however, similar side effects have been reported, underscoring the need for safer and more effective therapeutic alternatives.

In India, statistical surveys indicate that approximately 3,226 out of 4,752 communities rely on phytotherapy for primary healthcare. A comprehensive ethnobiological report commissioned by the Ministry of Environment and Forests highlights that indigenous tribes employ more than 7,500 plant species used for medicinal

***Corresponding Author:** Mr. Gunjansing Rajput

Address: Department of Pharmacology, Dr. D. Y. Patil College of Pharmacy, Akurdi, Pune 411044, Maharashtra, India

Email ✉**:** Gunjansingrajput17317@gmail.com

Tel.: 91-9657384524

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

purposes. According to the World Health Organization (WHO), phytomedicines represent a valuable source for developing pharmacologically active agents. Compared to synthetic drugs, plant-based therapeutics often exhibit fewer adverse effects and possess substantial therapeutic potential for managing chronic and metabolic disorders.

The growing global burden of obesity necessitates the exploration of alternative, multi-targeted therapeutic strategies, including polyherbal formulations (PHFs). The present study focuses on a PHF composed of *Zingiber officinale*, *Allium sativum*, *Glycyrrhiza glabra*, and *Gymnema sylvestre*, evaluated for its potential antiobesity activity. Each botanical component possesses distinct bioactive compounds that may act synergistically to modulate lipid metabolism, reduce adiposity, and enhance overall metabolic health. Ginger, containing gingerols, shogaols, and zingerone, exhibits thermogenic and lipid-lowering effects by promoting fatty acid oxidation, suppressing HMG-CoA reductase, and enhancing energy expenditure[6]; garlic, rich in allicin, S-allyl cysteine, and diallyl disulfide, regulates adipogenesis, elevates HDL cholesterol, and mitigates oxidative stress in adipose tissue[7]; licorice, containing glycyrrhizin, glabridin, and flavonoids, inhibits adipocyte differentiation, promotes lipolysis, and reduces oxidative damage[7]; while Gurmar, standardized for gymnemic acids, gurmarin, and gymnemosides, suppresses intestinal glucose absorption, improves insulin sensitivity, and modulates lipid metabolism through AMPK and PPAR signaling pathways.[8]

Although the individual lipid-lowering and metabolic regulatory effects of these botanicals have been extensively documented, their combined synergistic potential in a single polyherbal formulation has not yet been systematically investigated. This study, therefore, focuses on the development and preclinical evaluation of a novel PHF incorporating these botanicals to assess its antiobesity efficacy using an HFD-induced animal model. The research intends to provide comprehensive insights into the integrated mechanisms of action—encompassing lipid modulation, adiposity reduction, and metabolic regulation—thereby contributing new evidence toward the rational design of safe, natural, and multi-targeted therapeutic strategies for obesity management.

Materials And Methods

Plant material

Dried rhizomes of *Z. officinale*, bulbs of *A. sativum*, roots of *G. glabra*, and leaves of *G. sylvestre* were procured in the form of coarse powder from Manakarnika Aushadhalaya, Pune, Maharashtra, India, in December 2023. The plant materials were authenticated and certified by the supplying establishment (Authentication Certificate No. CH-CC-69685, dated December 27, 2023).

Drugs and chemicals

The high-fat diet (HFD) used in the experiment was prepared at Dr. D. Y. Patil College of Pharmacy, Akurdi, Pune, Maharashtra, India. The composition of the HFD included 68% standard rat feed (chow), 30% saturated fat (Dalda), and 2% cholesterol. Orlistat, manufactured by Sinsan Pharmaceuticals Pvt. Ltd., was used as the reference medication. All substances used in the experiment were of analytical grade and procured from reliable suppliers.

Preparation of plant extracts

Maceration

For the extraction process, simple maceration was employed. The specified quantity of herbal materials was weighed, and each herb was macerated with a solvent mixture of 70% ethanol and water in an 80:20 ratio in a beaker. The phytoconstituents were allowed to dissolve into the ethanol by moderately shaking the beaker for 3 days.

Filtration

After 3 days, the mixture was subjected to a simple filtration process. The filtration was performed using standard filter paper and a funnel to separate the extract.

Evaporation

The filtrate was then evaporated using an electronic water bath. Evaporation was carried out at a temperature of 60°C until the necessary amount of extract was produced.

Evaluation of plant extracts Phytochemical screening

The hydroalcoholic extracts of *Z. officinale*, *A. sativum*, *G. glabra*, and *G. sylvestre* were tested for the detection of phytochemicals, including alkaloids, glycosides, phenols, tannins, and flavonoids.

Preparation of polyherbal formulation

The formulation of an elixir was performed through a series of systematic steps. Initially, active compounds were prepared by incorporating the necessary excipients and pharmaceuticals. Herbal extracts of A. *sativum, G. sylvestre, G. glabra,* and *Z. officinale* were dissolved in 15 mL of alcohol. Concurrently, sodium saccharin was dissolved in 20 mL of water with continuous stirring to confirm complete dissolution. Subsequently, the alcohol-soluble and water-soluble components were combined in water. Preservatives and flavoring agents, including methylparaben, propylparaben, and orange syrup, were added to the combination.

To create a homogenous elixir, the final volume of solution was adjusted with water, and a magnetic stirrer was used to homogenize the mixture.

Experimental animals

The National Institute of Biosciences Pvt. Ltd. supplied Wistar albino rats weighing 180-200 gm. The animals

were fed standard rat feed (chow) and water *ad libitum*, with a 12-hour light/dark cycle, controlled temperature, and humidity. The college's IAEC (Protocol no. DYPCOP/IAEC/2023/09) accepted the protocol for this preclinical study.

Acute oral toxicity study

The formulation's acute oral toxicity was evaluated according to OECD Guideline 425. Overnight-fasted Wistar rats were administered the PHF orally as per the guidelines. Individual rats were observed over 48 hours for behavioral and neurological abnormalities, such as diarrhea, eating changes, convulsions, tremors, lacrimation, sleep disorders, and salivation, to detect toxicity. The rats were monitored for a further two weeks to confirm any possible mortality.

Antiobesity activity Induction of obesity

The PHF's antiobesity effects were studied in rats fed a high-fat diet. In this study, Wistar rats weighing between 180 to 200 grams were used. For 15 days, the rats were fed a high-fat diet containing of 68% conventional rat chow, 30% Dalda (saturated fat), and 2% cholesterol. (excluding the normal control)

Grouping of animals

The experimental animals were allocated into five distinct groups, with six rats in each group. Group I acted as the regular control, receiving a standard rat feed and vehicle. Group II, designated as the HFD control, was given an HFD and treated with the vehicle. The standard group (Group III) got an HFD and 20 mg/kg of orlistat. Groups IV and V were administered HFD along with PHF at doses of 150 and 300 mg/kg, respectively, orally once daily for 30 days.

Antiobesity screening

Biochemical estimations in serum

A commercial assay kit was used to assess triglycerides (TG), serum total cholesterol (TC) and low-density lipoprotein (LDL). The detailed protocols for these estimations are provided in the accompanying documentation of the respective kits.

Liver function test

A commercial assay kit was used to quantify aspartate aminotransferase (AST) and alanine aminotransferase (ALT). The detailed protocols for these estimations are provided in the accompanying documentation of the respective kits.

Histopathological examination

The animals used in the study were euthanized, and samples of adipose and hepatic tissues were isolated for histopathological studies.

Statistical Analysis

GraphPad Prism, version 8, was used for statistical comparisons, with significance set at $p < 0.05$. Data for each set of six rats are presented as mean ± SEM and analyzed using one-way ANOVA and the Dunnett test.

Results

Evaluation of plant extracts

Phytochemical analysis of hydroalcoholic herbal extracts of *A. sativum (AS), G. sylvestre (GS), G. glabra (GG), and Z. officinale (ZO)* showed the presence of flavonoids and carbohydrates. GS indicates the presence of terpenoids, tannins, saponins, and alkaloids. AS and Zo showed the presence of alkaloids and saponins.

Acute oral toxicity study

The acute oral toxicity experiment showed that PHF was safe up to 2000 mg/kg with no behavioral or neurological damage.

Antiobesity screening

Serum lipid profiles

Total cholesterol

The HFD control group of rats fed a high-fat diet for 15 days had higher plasma TC levels. The plasma TC levels of groups treated with 150 and 300 mg/kg dosages of PHF were determined on days 0 and 28, respectively. Fig. 1 demonstrates that administering PHF at 150 and 300 mg/kg resulted in a considerable drop in TC levels towards normal levels. Treatment with 20 mg/kg orlistat significantly decreased TC levels ($p < 0.001$) compared to the HFD control group.

Triglycerides (TG)

The HFD control group, consisting of rats fed a high-fat diet for 15 days, exhibited higher plasma TG levels. The plasma TG levels of groups treated with 150 and 300 mg/

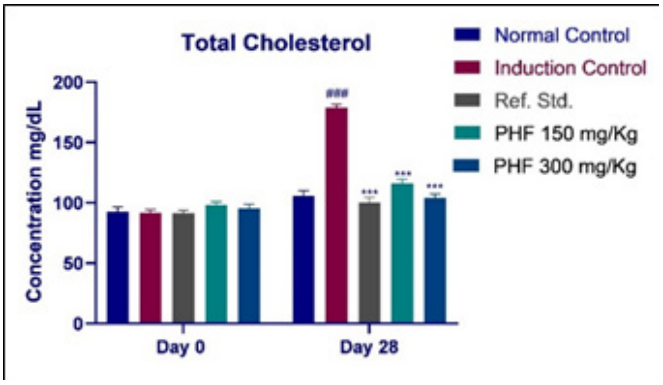


Fig. 1: Effect of PHF on Total Cholesterol in HFD-induced obese rats

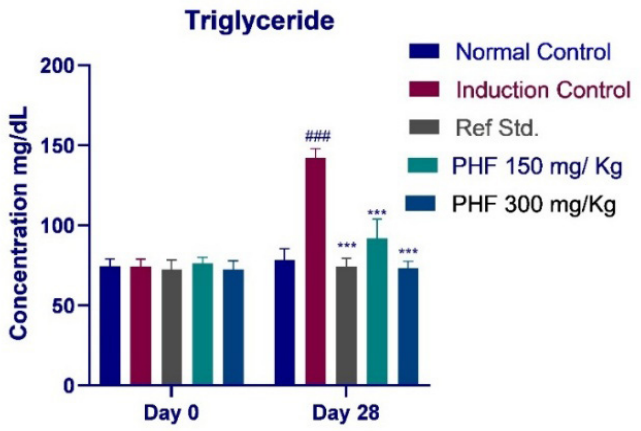


Fig. 2: Effect of PHF on Triglyceride in HFD-induced Obese Rats

kg dosages of PHF were determined on days 0 and 28, respectively. Fig. 2 demonstrates that administering PHF at 150 and 300 mg/kg resulted in a considerable drop in TG levels towards normal levels. Treatment with 20 mg/kg orlistat significantly decreased TG levels ($p < 0.001$) compared to the HFD control group.

Low-density lipoprotein cholesterol

The HFD control group of rats fed a high-fat diet for 15 days had higher plasma LDL-c values. The plasma LDL-c levels of groups treated with 150 and 300 mg/kg dosages of PHF were determined on days 0 and 28, respectively. Fig. 3 demonstrates that administering PHF at 150 and 300 mg/kg resulted in a considerable drop in LDL-c levels towards normal levels. Treatment with 20 mg/kg orlistat significantly decreased LDL-c levels ($p < 0.001$) compared to the HFD control group.

Liver profile

The HFD control group of rats was fed an HFD for 15 days. After 15 days, serum transaminase levels, specifically ALT

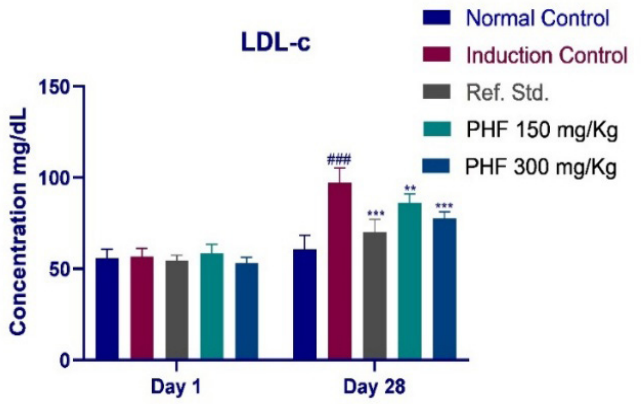


Fig. 3: Effect of PHF on LDL-c in HFD-induced obese rats

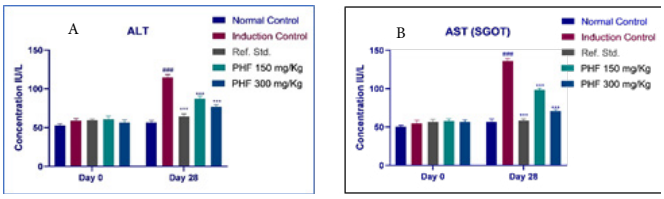


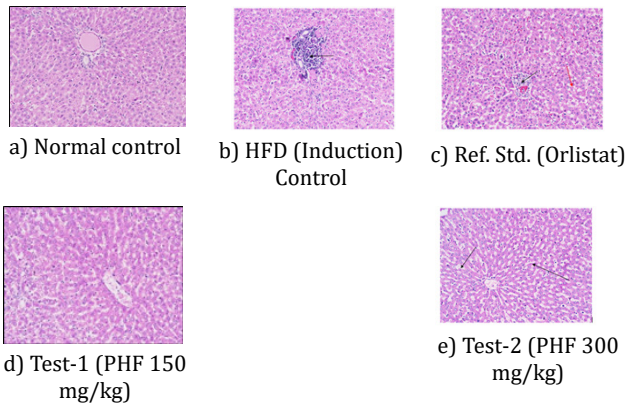
Fig. 4: Effect of PHF on (A) ALT (B) AST in HFD-induced obese rats

and AST, were markedly elevated ($p < 0.001$) in the HFD control group. Fig. 4A demonstrates that administering PHF at 150 and 300 mg/kg resulted in a considerable drop in ALT levels towards normal levels. Treatment with 20 mg/kg orlistat significantly decreased ALT levels ($p < 0.001$) compared to the HFD control group. Fig. 4B demonstrates that administering PHF at 150 and 300 mg/kg resulted in a considerable drop in AST levels towards normal levels. Treatment with 20 mg/kg orlistat significantly decreased AST levels ($p < 0.001$) compared to the HFD control group.

Histopathological studies

Histopathology of the liver

A histological investigation found no abnormalities in the hepatocytes of rats in the normal control group and intact tissue architecture (Fig. 5a). Rats in the induction control group showed infiltration in the portal tract and inflammatory zones in their hepatocytes (Fig. 5b). However, in the treatment groups, rats given PHF (150 mg/kg) showed normal architecture of hepatocytes, Kupffer cells, sinusoid space, bile duct cells, central vein, and portal



a) Normal control

b) HFD (Induction) Control

c) Ref. Std. (Orlistat)

d) Test-1 (PHF 150 mg/kg)

e) Test-2 (PHF 300 mg/kg)

Fig. 5: Histopathology of the hepatocytes in normal, HFD-induced obese, and PHF-treated rats (H&E, 200X). Fig. a) shows the normal architecture of hepatocytes in a normal control. b) Induction control shows inflammatory cell (arrow) infiltration in the portal tract. c) Ref. The standard shows minimal inflammatory cells (arrow) in the portal tract and increased sinusoidal space (red arrow). d) Test 1 (PHF 150 mg/kg) tissue shows the normal architecture of hepatocytes, central vein, sinusoid space, Kupffer cells, bile duct cells, and portal triad. e) Test 2 (PHF 300 mg/kg) tissue shows increased sinusoidal space of hepatocytes (arrow).

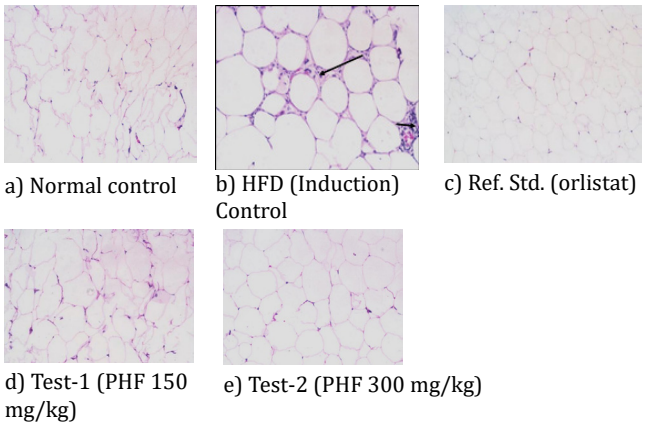


Fig. 6: Histopathology of adipose tissue in normal, HFD-induced Obese, and PHF-treated rats. Fig. a) shows the normal architecture of cells and the nucleus at the peripheral site. b) fat tissue shows inflammatory cell (arrow) infiltration in adipose cells. c) shows fat tissue, which shows the normal architecture of cells and nucleus at the peripheral site. d) fat tissue shows the normal architecture of cells and nucleus at peripheral sites. e) fat tissue shows the normal architecture of cells and nucleus at the peripheral site.

triad (Fig. 5d). Compared to the induction control group, rats given PHF (300 mg/kg) and 20 mg/kg of orlistat demonstrated minimal inflammatory cells (arrow) in the portal tract and increased sinusoidal space (red arrow) (Fig. 5e and c).

Histopathology of the adipose tissue

In a histopathological study, the adipose tissue of rats in the normal control group showed no abnormality and intact tissue architecture (Fig. 6a). Rats in the induction control group showed inflammatory cell (arrow) infiltration in adipose cells (Fig. 6b). However, in the treatment groups, rats given PHF (150 mg/kg) showed normal architecture of adipose tissue, with the nucleus at the peripheral site (Fig. 6d). Compared to the induction control group, rats given PHF (300 mg/kg) and 20 mg/kg of orlistat demonstrated normal architecture of cells (Fig. 6e and 6c).

Discussion

The present study demonstrates that the standardized polyherbal formulation (PHF) comprising *Z. officinale*, *A. sativum*, *G. glabra*, and *G. sylvestre* exerts noteworthy antiobesity action in high-fat diet-induced obese rats. Treatment with PHF led to dose-dependent reductions in body weight, serum total cholesterol, TG, VLDL-c, and LDL-c, alongside improvements in HDL-c and normalization of liver enzyme levels. Histopathological analyses confirmed reduced adipocyte hypertrophy and restoration of hepatic architecture, corroborating the biochemical findings. These effects are likely mediated through the synergistic action of bioactive compounds that inhibit adipogenesis, enhance fatty acid oxidation, and mitigate oxidative stress. Compared to conventional antiobesity agents, PHF provides multi-targeted benefits, highlighting its potential as a safer, natural alternative. This study bridges traditional Ayurvedic knowledge with modern pharmacology by systematically evaluating standardized extracts, demonstrating multi-pathway activity in lipid modulation and metabolic regulation. While the preclinical nature, short treatment duration, and single obesity model represent limitations, the findings provide a foundation for further molecular investigations into mechanisms involving AMPK, PPAR signaling, and inflammatory pathways. Overall, this research offers novel insights into the therapeutic potential of PHF, supporting its role as a promising candidate for complementary management of obesity and related metabolic disorders.

Conclusion

The developed polyherbal formulation (PHF) demonstrated substantial antiobesity effects in HFD-induced obese rats by reducing body weight, improving serum lipid profiles, and normalizing liver enzyme levels. Histopathological analysis confirmed restoration of hepatic and adipose tissue structure, supporting the biochemical findings. The observed effects suggest that PHF exerts its action through modulation of lipid metabolism, inhibition of adipogenesis, and enhancement of fatty acid oxidation. Overall, the study indicates that the PHF is a safe, effective, and natural therapeutic approach for obesity management, warranting further investigation to elucidate its molecular mechanisms.

Acknowledgments

The author is grateful to Dr. D. Y. Patil College of Pharmacy, Akurdi, Pune, for providing laboratory infrastructure and support that facilitated the completion of this research. The author also thanks Gurukrupa Lab, Sambhajinagar, for their assistance during the histopathological studies.

References

1. Dahanukar SA, Kulkarni RA, Rege NN. Pharmacology of medicinal plants and natural products. Indian Journal of Pharmacology. 2000; 32:81–118. Available from: https://journals.lww.com/iphr/citation/2000/32040/pharmacology_of_medicinal_plants_and_natural.11.aspx
2. Brown SL. Lowered serum cholesterol and low mood. BMJ. 1996; 313:637–638. Available from: https://doi.org/10.1136/bmj.313.7058.637
3. Jeyaprakash K, Ayyanar M, Geetha KN, Sekar T. Traditional uses of medicinal plants among the tribal people in Theni District (Western Ghats), Southern India. Asian Pacific Journal of Tropical Biomedicine. 2011;1: S20–S25. Available from: https://doi.org/10.1016/S2221-1691(11)60115-9
4. Yadav RN, Agarwala M. Phytochemical analysis of some medicinal plants. Journal of Phytology. 2011;3: Available from: https://www.researchgate.net/publication/267801472_Phytochemical_analysis_of_some_medicinal_plants
5. Parekh J, Jadeja D, Chanda S. Efficacy of aqueous and methanol extracts of some medicinal plants for potential antibacterial activity. Turkish Journal of Biology. 2005;29:203–210. Available from: https://journals.tubitak.gov.tr/biology/vol29/iss4/3

6. Seo SH, Fang F, Kang I. Ginger (*Zingiber officinale*) attenuates obesity and adipose tissue remodeling in high-fat diet-fed C57BL/6 mice. International Journal of Environmental Research and Public Health. 2021;18:631. Available from: doi.org/10.3390/ijerph18020631
7. Wu Y, Wang Z, Du Q, Zhu Z, Chen T, Xue Y, Wang Y, Zeng Q, Shen C, Jiang C, Liu L. Pharmacological effects and underlying mechanisms of licorice-derived flavonoids. Evidence-Based Complementary and Alternative Medicine. 2022;2022:9523071. Available from: doi.org/10.1155/2022/9523071
8. Roh C, Jung U. Screening of crude plant extracts with antiobesity activity. International Journal of Molecular Sciences. 2012;13:1710–1719. Available from: doi.org/10.3390/ijms13021710
9. Rasheed A, Avinash Kumar Reddy G, Mohanalakshmi S, Ashok Kumar CK. Formulation and comparative evaluation of polyherbal anti-acne face wash gels. Pharmaceutical Biology. 2011;49:771–774. Available from: https://doi.org/10.3109/13880209.2010.547207
10. Parasuraman S, Thing GS, Dhanaraj SA. Polyherbal formulation: Concept of Ayurveda. Pharmacognosy Reviews. 2014;8:73–80. Available from: https://doi.org/10.4103/0973-7847.134229
11. Talekar YP, Apte KG, Paygude SV, Tondare PR, Parab PB. Studies on wound healing potential of polyherbal formulation using in vitro and in vivo assays. Journal of Ayurveda and Integrative Medicine. 2017;8:73–81. Available from: https://doi.org/10.1016/j.jaim.2016.11.007
12. Organisation for Economic Co-operation and Development. Test No. 425: Acute oral toxicity: Up-and-down procedure. OECD Publishing. 2008. Available from: https://doi.org/10.1787/9789264071049-en
13. Guido SH, Joseph TH. Effect of chemically different calcium antagonists on lipid profile in rats fed on a high fat diet. Indian Journal of Experimental Biology. 1992;30:292–294. Available from: https://europepmc.org/article/med/1459596
14. Tiwari R, Gupta P, Verma AK. Antiobesity activity of extract of Curculigo orchioides Gaertn. root in high-fat diet-induced obesity in rats. International Journal of Pharmaceutical Sciences and Drug Research. 2020;13:488–494. Available from: https://doi.org/10.25004/IJPSDR.2021.130505
15. Kumar V, Bhandari U, Tripathi CD, Khanna G. Antiobesity effect of Gymnema sylvestre extract on high fat diet-induced obesity in Wistar rats. Drug Research. 2013;63:625–632. Available from: https://doi.org/10.1055/s-0033-1349852
16. Rexrode KM, Carey VJ, Hennekens CH, Walters EE, Colditz GA, Stampfer MJ, Willett WC, Manson JE. Abdominal adiposity and coronary heart disease in women. JAMA. 1998;280:1843–1848. Available from: https://doi.org/10.1001/jama.280.21.1843
17. Church T, Martin CK. The obesity epidemic: A consequence of reduced energy expenditure and the uncoupling of energy intake? Obesity. 2018;26:14–16. Available from: https://doi.org/10.1002/oby.22072
18. Sclafani A. Animal models—etiologic classification. International Journal of Obesity. 1984;8:491–508. Available from: https://pubs.sciepub.com/ajmsm/3/4/4
19. Carlson MJ, Thiel KW, Yang S, Leslie KK. Catch it before it kills: Progesterone, obesity, and the prevention of endometrial cancer. Discovery Medicine. 2012;14:215–222. Available from: https://pubmed.ncbi.nlm.nih.gov/23021376/
20. Mandour T, Kissebah AH, Wynn V. Mechanism of oestrogen and progesterone effects on lipid and carbohydrate metabolism: Alteration in the insulin:glucagon molar ratio and hepatic enzyme activity. European Journal of Clinical Investigation. 1977;7:181–187. Available from: https://doi.org/10.1111/j.1365-2362.1977.tb01595.x
21. Jeyakumar SM, Nalini N, Menon VP. Antioxidant activity of ginger. Medical Science Research. 1999;27:341–344. Available from: https://doi.org/10.1016/j.jgeb.2018.03.003
22. Hyson DA, Schneeman BO, Davis PA. Almonds and almond oil have similar effects on plasma lipids and LDL oxidation in healthy men and women. Journal of Nutrition. 2002;132:703–707. Available from: https://doi.org/10.1093/jn/132.4.703
23. Festi D, Colecchia A, Sacco TA, Bondi M, Roda E, Marchesini G. Hepatic steatosis in obese patients: Clinical aspects and prognostic significance. Obesity Reviews. 2004;5:27–42. Available from: https://doi.org/10.1111/j.1467-789x.2004.00126.x

HOW TO CITE THIS ARTICLE: Rajput G, Shirode D, Patil A, Gunjal A, Bairagi P, Patil V, Deore M. Multi-pathway Antiobesity Effects of a Standardized Ginger-Garlic-Licorice-Gurmar Polyherbal Formulation in Diet-Induced Obesity. Int. J. Pharm. Sci. Drug Res. 2025;17(6):503-508. **DOI:** 10.25004/IJPSDR.2025.170603