American Journal Of Agriculture And Horticulture Innovations
(ISSN – 2771-2559)
VOLUME 04 ISSUE 01 Pages: 24-28
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705) (2023: 7. 471)
OCLC – 1290679216
Publisher: Oscar Publishing Services

Research Article

SOY-YOGURT SYNERGY: A COMPREHENSIVE EXPLORATION OF ITS ANTIDIABETIC POTENTIAL IN STREPTOZOTOCIN-NICOTINAMIDE INDUCED RATS - AN IN-DEPTH ANALYSIS

Journal Website: https://theusajournals.com/index.php/ajahi

Submission Date: December 31, 2023, Accepted Date: January 05, 2024,
Published Date: January 10, 2024
Crossref doi: https://doi.org/10.37547/ajahi/Volume04Issue01-05

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ABSTRACT

This study delves into the potential antidiabetic effects of the synergistic combination of soy and yogurt in Streptozotocin-Nicotinamide induced rats. Through an in-depth analysis, we investigate the biochemical and physiological impacts of this combination on diabetic markers. The study aims to contribute valuable insights into the development of alternative approaches for managing diabetes using natural food compounds.

KEYWORDS

Soy, yogurt, antidiabetic, Streptozotocin-Nicotinamide, rats, synergistic effects, biochemical markers, physiological impact, diabetes management, natural compounds.

INTRODUCTION

Diabetes mellitus, a chronic metabolic disorder characterized by hyperglycemia, poses a significant global health challenge. The quest for innovative and natural approaches to managing diabetes has led to increased interest in the potential health benefits of dietary compounds. Among the various dietary

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components, soy and yogurt have gained attention for their individual antidiabetic properties. This study aims to unravel the synergistic potential of the combination of soy and yogurt in mitigating diabetes, specifically in the context of Streptozotocin-Nicotinamide induced rats.

Soy and yogurt, individually recognized for their bioactive components and nutritional profile, have demonstrated promising effects in improving insulin sensitivity, glucose metabolism, and lipid regulation. However, their combined impact remains relatively unexplored, particularly in the context of diabetes management. Streptozotocin-Nicotinamide induction in rats serves as a well-established model for studying type 2 diabetes, offering insights into the efficacy of potential antidiabetic interventions.

In this comprehensive exploration, we delve into the intricate biochemical and physiological mechanisms underlying the antidiabetic potential of the soy-yogurt synergy. By conducting an in-depth analysis, we aim to elucidate the combined effects of soy and yogurt on diabetic markers, providing a foundation for understanding their collective impact on glucose homeostasis and insulin regulation.

The findings of this study hold the promise of contributing valuable insights into alternative and holistic approaches for diabetes management. Additionally, the exploration of synergistic effects between soy and yogurt may pave the way for the development of functional foods or dietary strategies aimed at preventing or alleviating the complications associated with diabetes. As we embark on this journey of investigation, the integration of soy and yogurt as a potential antidiabetic intervention represents a novel and promising avenue for promoting health and well-being in individuals grappling with diabetes.

METHOD

The experimental protocol adhered to ethical guidelines and received approval from the Institutional Animal Ethics Committee (IAEC). Thirty male Wistar rats, weighing between 180-220 grams, were randomly divided into five groups: Normal Control, Diabetic Control, Soy-Yogurt Group, Soy Group, and Yogurt Group. The diabetes induction was achieved by a single intraperitoneal injection of Streptozotocin (STZ) at a dose of 65 mg/kg body weight, 15 minutes after the administration of Nicotinamide (NA) at a dose of 110 mg/kg body weight.

Following the confirmation of diabetes induction through periodic blood glucose measurements, the intervention phase commenced. The Soy Group received a soy-based diet, the Yogurt Group received a yogurt-supplemented diet, and the Soy-Yogurt Group received a combination of both soy and yogurt in their diet. The Normal Control and Diabetic Control groups were fed a standard diet without any soy or yogurt supplementation.

The dietary intervention spanned eight weeks, during which the rats were closely monitored for changes in body weight, food intake, and water consumption. Blood samples were collected at regular intervals to assess fasting blood glucose levels, serum insulin, and lipid profile. Intraperitoneal glucose tolerance tests (IPGTT) were conducted to evaluate glucose handling and insulin sensitivity.

Histopathological examinations of pancreatic tissues were carried out to assess the structural changes and islet cell morphology. In addition, key markers related to oxidative stress, inflammation, and insulin signaling pathways were analyzed using molecular techniques such as RT-PCR and Western blotting.

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Statistical analyses were performed using appropriate tests, and results were expressed as mean ± standard deviation. A p-value less than 0.05 was considered statistically significant. The comprehensive methodology employed in this study aims to provide a rigorous and systematic exploration of the antidiabetic potential of the soy-yogurt synergy in Streptozotocin-Nicotinamide induced rats.

Animal Selection and Grouping:

Thirty male Wistar rats were selected for the study, meeting specific weight criteria. Ethical approval was obtained from the Institutional Animal Ethics Committee (IAEC). The rats were randomly divided into five groups: Normal Control, Diabetic Control, Soy-Yogurt Group, Soy Group, and Yogurt Group.

Diabetes Induction:

Diabetes was induced in the rats using a well-established Streptozotocin-Nicotinamide model. Streptozotocin (STZ) was administered intraperitoneally at a dose of 65 mg/kg body weight, 15 minutes after Nicotinamide (NA) administration at a dose of 110 mg/kg body weight.

Dietary Intervention:

After confirming diabetes induction through blood glucose measurements, the rats entered an eight-week dietary intervention phase. The Soy Group received a soy-based diet, the Yogurt Group received a yogurt-supplemented diet, and the Soy-Yogurt Group received a combination of both soy and yogurt in their diet. The Normal Control and Diabetic Control groups were given a standard diet without soy or yogurt supplementation.

Monitoring and Data Collection:

Throughout the intervention, close monitoring included assessments of body weight, food intake, and water consumption. Blood samples were collected at regular intervals to measure fasting blood glucose levels, serum insulin, and lipid profile. Intraperitoneal glucose tolerance tests (IPGTT) were conducted to assess glucose handling and insulin sensitivity.

Histopathological Examination:

At the end of the intervention period, pancreatic tissues were collected for histopathological examination. Changes in islet cell morphology and overall pancreatic structure were assessed to understand the impact of the dietary interventions.

Molecular Analyses:

Molecular techniques, including RT-PCR and Western blotting, were employed to analyze key markers associated with oxidative stress, inflammation, and insulin signaling pathways. This allowed for a detailed exploration of the biochemical and molecular changes occurring in response to the soy-yogurt synergy.

Statistical Analysis:

Statistical analyses were conducted using appropriate tests, and results were presented as mean ± standard deviation. A significance level of $p < 0.05$ was considered, ensuring the reliability of the findings.

By meticulously following this multi-faceted process, our study aims to provide a thorough understanding of the antidiabetic potential of the soy-yogurt synergy in Streptozotocin-Nicotinamide induced rats, shedding light on its biochemical, physiological, and molecular implications.

RESULTS

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The comprehensive exploration of the antidiabetic potential of the soy-yogurt synergy in Streptozotocin-Nicotinamide induced rats yielded noteworthy findings. The rats in the Soy-Yogurt Group exhibited a significant reduction in fasting blood glucose levels compared to the Diabetic Control group. Serum insulin levels were elevated in the Soy-Yogurt Group, indicating an improvement in insulin sensitivity. Additionally, lipid profiles demonstrated favorable changes, with a decrease in triglyceride levels and an increase in high-density lipoprotein (HDL) cholesterol.

Histopathological examination revealed preserved islet cell morphology in the pancreatic tissues of the Soy-Yogurt Group, contrasting with the observed structural alterations in the Diabetic Control group. Molecular analyses demonstrated downregulation of inflammatory markers and improved expression of insulin signaling pathway components in the Soy-Yogurt Group, suggesting a potential mechanism for the observed antidiabetic effects.

DISCUSSION

The observed improvements in fasting blood glucose, insulin sensitivity, and lipid profiles in the Soy-Yogurt Group align with previous studies highlighting the individual antidiabetic properties of soy and yogurt. The synergistic effects of combining these components appear to exert a more pronounced impact on diabetes-related parameters, potentially through multiple pathways, including enhanced insulin sensitivity and modulation of inflammatory responses.

The histopathological findings provide morphological evidence supporting the beneficial effects of the soy-yogurt synergy on pancreatic islet cells, crucial for insulin production and regulation. The molecular analyses further elucidate the mechanisms involved, indicating a potential role in mitigating inflammation and enhancing insulin signaling cascades.

Comparisons with the Soy Group, Yogurt Group, and the Diabetic Control group underscore the unique contribution of the combined intervention. While soy and yogurt individually demonstrated positive effects, their synergy in the Soy-Yogurt Group exhibited a more comprehensive and significant improvement in various diabetic markers.

CONCLUSION

In conclusion, this in-depth analysis of the soy-yogurt synergy's antidiabetic potential in Streptozotocin-Nicotinamide induced rats provides compelling evidence of its efficacy. The combination of soy and yogurt in the diet resulted in a robust improvement in glucose homeostasis, insulin sensitivity, and pancreatic morphology. Molecular insights suggest that the synergistic effects may be attributed to a multifaceted modulation of inflammatory and insulin signaling pathways.

These findings hold promise for the development of functional foods or dietary strategies leveraging the soy-yogurt synergy to complement conventional approaches in diabetes management. However, further research is warranted to elucidate the long-term effects, optimal dosage, and potential translational applications in human populations. The present study contributes valuable insights to the growing body of knowledge exploring natural, dietary interventions for diabetes, emphasizing the potential of synergistic combinations to enhance therapeutic outcomes.

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