ABSTRACT

SCREENING OF PHYTOCHEMICALS IN SELECTED PLANTS FROM SIKKIM AND DARJEELING HIMALAYAN REGION FOR POTENTIAL DRUG DEVELOPMENT AGAINST METABOLIC DISORDER AND INFLAMMATION

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Chapter 1: Introduction

This chapter underscores the importance of medicinal plants, stressing their traditional uses and the need for scientific validation of their therapeutic properties. It specifically examines ethnomedicinal plants from the biodiverse Darjeeling Himalayan region, recognized for its traditional healing practices. The study employs phytochemical and phytotherapeutic methods to identify bioactive compounds and validate their pharmacological properties, focusing on antioxidant, antidiabetic, and anti-inflammatory activities. Ultimately, the research aims to integrate traditional knowledge with modern science to develop potential drugs for conditions like diabetes, inflammation, and infections.

Chapter 2: Literature review on Himalayan region and Selected plants

The literature review provides a comprehensive overview of the Darjeeling region's socioeconomic conditions, emphasizing how ethnomedicinal plants, such as *Asparagus racemosus Willd and Duabanga grandiflora*, play an essential role in traditional practices. The review details the ecological niche, taxonomic classification, and medicinal uses of these plants, demonstrating the importance of scientific exploration in validating their therapeutic properties.

Chapter 3: Pharmacognostic Evaluation of *Asparagus racemosus* Willd and *Duabanga grandiflora*

This chapter details the collection and authentication of *Asparagus racemosus aerial part and Duabanga grandiflora* leaves and flower for pharmacognostic studies. It describes the plants' organoleptic, macroscopic, and microscopic characteristics, including sample preparation, staining, and photomicrograph analysis. Powder microscopy reveals cellular structures, while physicochemical analysis examines extractive values, ash content, and moisture loss. Fluorescence analysis under UV light further explores their visual properties.

Chapter 4. Phytochemical investigation of *Asparagus racemosus Willd and Duabanga grandiflora*

In the subsequent chapters, the study presents a detailed phytochemical investigation of *A. racemosus* aerial parts and *D. grandiflora* leaves and flowers, identifying various bioactive compounds, such as alkaloids, flavonoids, saponins, and phenolic compounds, that contribute to the plants' therapeutic potential.

Chapter 5. Phytochemical profiling through analytical techniques

Analytical techniques like High-Performance Thin-Layer Chromatography (HPTLC), Gas Chromatography-Mass Spectrometry (GC-MS), and Liquid Chromatography-Mass Spectrometry (LC-MS) are employed for in-depth profiling, quantifying the compounds that may serve as natural therapeutic agents**.**

Chapter 6. *In vitro* anti-oxidant activity

A significant focus of the research is the *in vitro* investigation of the antioxidant activities of the plant extracts. Various assays, including DPPH, FRAP, and metal chelating tests, are conducted, demonstrating that the plants exhibit strong antioxidant activities, which correlate with their high content of flavonoids and phenolic compounds. These findings support the plants' traditional use in managing oxidative stress-related disorders.

Chapter 7. Study of *in vitro* anti-diabetic activity

The study extends to evaluating the plants' antidiabetic potential through in vitro assays, such as alpha-amylase and alpha-glucosidase inhibition tests. The results reveal that the methanolic extracts of both plants have substantial inhibitory effects on these enzymes, suggesting their potential to regulate glucose levels and improve glycemic control. These results, coupled with their antioxidant properties, indicate that these plants could be valuable in managing diabetes.

Chapter 8. *In vitro* anti-inflammatory study

In addition to antidiabetic properties, the anti-inflammatory potential of of *A. racemosus* aerial parts and *D. grandiflora* leaves and flower's extracts were examined through protein denaturation assays. The results show that the methanolic extracts of both plants effectively inhibit protein denaturation, which is a key mechanism in inflammation. This suggests that

these plants have significant anti-inflammatory activity, which supports their use in traditional medicine for managing inflammatory conditions.

Chapter 9 & 10 *In vitro* antimicrobial activity study and *In vitro* cytotoxic activity study

Further studies assess the antimicrobial properties of the plants, indicating that the methanolic extracts exhibit strong inhibitory effects against various pathogenic microorganisms. This aligns with the plants' traditional use in treating infections and suggests their potential as natural antimicrobial agents. Additionally, cytotoxicity assays using the MTT assess cell viability demonstrate the extracts' ability to inhibit the proliferation of cancer cells, highlighting their relevance in cancer research and their potential role as natural anticancer agents.

Chapter 11. *In vivo* Antidiabetic activity of *Asparagus racemosus willd and Duabnaga grandiflora*

Finally, *in vivo* studies of the antidiabetic activity of these plants in STZ-Nicotinamide Type II diabetes animal models confirm their efficacy in lowering blood glucose levels and improving metabolic parameters, reinforcing the in vitro findings. The methanolic extracts also show significant potential in improving lipid metabolism, suggesting protective effects against diabetes-related complications.

Chapter 12. Study of Anti-Inflammatory activity of Methanolic extracts from *Asparagus racemosus* Willd's aerial part and *Duabanga grandiflora's* leaves

This chapter examines the anti-inflammatory activity of methanolic extracts from the aerial parts of *Asparagus racemosus* and leaves of *Duabanga grandiflora* using a carrageenan-induced paw edema model. The extracts significantly reduced inflammation markers such as edema and pro-inflammatory cytokines. Both extracts showed strong anti-inflammatory effects compared to controls, supporting their traditional use in managing inflammatory conditions. The results suggest that the bioactive compounds in these plants may influence inflammatory pathways, highlighting their potential in anti-inflammatory treatments.

Chapter 13 & 14. Green Synthesis of Silver Nano particles from *Asparagus racemosus* Willd aerial parts and *Duabanga grandiflora's* leaves

An innovative aspect of this research is the green synthesis of silver nanoparticles using aqueous extracts from *A. racemosus* aerial part and *D. grandiflora* leaves. This eco-friendly approach not only provides a sustainable method for nanoparticle synthesis but also demonstrates the antimicrobial potential of the silver nanoparticles, which could be further explored for biomedical applications

Chapter 15. Conclusion

This research offers a thorough investigation of *Asparagus racemosus and Duabanga grandiflora*, validating their traditional medicinal uses through pharmacognostic, phytochemical, and biological studies. The demonstrated antioxidant, antidiabetic, anti-inflammatory, antimicrobial, and cytotoxic activities confirm their therapeutic potential. Additionally, the green synthesis of silver nanoparticles from plant extracts highlights the importance of eco-friendly practices in nanomedicine. The study emphasizes the integration of traditional knowledge with modern scientific methods, encouraging future research in drug development based on ethnomedicinal plants.

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