Frontiers in Pharmaceutical, Material, and Environmental Sciences: Innovative Approaches and Applications

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1st Print Edition - 2026

Title: ***Frontiers in Pharmaceutical, Material, and Environmental Sciences: Innovative Approaches and Applications***

Editors: ***Tahmeena Khan, Qazi Inamur Rahman, Nafees Ahmad, Shahla Tanveer***

ISBN: 978-93-6884-630-7

MRP: 370/-INR

(Printed in India)

PREFACE

This book brings together a collection of research studies that delve into the fields of pharmaceutical science, materials science, and environmental science. The chapters within this volume highlight innovative methods and significant discoveries in these areas. The research presented here explores the development of advanced drug delivery systems, the therapeutic potential of natural products, the removal of environmental pollutants, and the optimization of material properties. By combining experimental techniques with computational modeling, the authors have gained deeper insights into the underlying mechanisms of these processes. We hope this book will serve as a valuable resource for researchers, academics, and industry professionals in these fields. The knowledge and insights provided here will contribute to the advancement of scientific research and the development of sustainable solutions for global challenges.

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Chapter – 8

Extraction of Piperine from Black Pepper

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Abstract

Black pepper is cultivated and harvested in tropical regions of Sri Lanka and India. Black pepper is one of the most commonly consumed spices, and its pungency is mostly due to the presence of alkaloid known as piperine. Piperine is found in black pepper (*piper nigrum*) and white pepper. Piperine represents diverse biological activities, such as anti-inflammatory, anticancer, antiviral, pesticide anti-Alzheimer's, antidepressant and most importantly piperine is known as the bioavailability enhancer (it is one of the most promising bio enhancers to date). Furthermore, different combinations of piperine with available marketed drugs to improve the bioavailability have also been included. This naturally occurring alkaloid has numerous demonstrated health effects and beneficial therapeutic properties; nevertheless, its biological applications are limited due to its poor solubility in an aqueous environment. This paper presents isolation from pepper using soxhlet extraction and steam distillation process. The methods under study involve the extraction of piperine with various solvents such as ethanol and dichloromethane. Then isolation and purification were followed by separate classical methods for respective extracts. Then identification of the compound was confirmed by various analytical methods melting point, FT-IR Spectroscopy compared it with authentic piperine which resulted in better pure piperine crystals as that of authentic piperine.

Keywords: Piperine, soxhlet, black pepper, steam distillation,