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Vartika Jain · Surendra K. Verma

Pharmacology of *Bombax ceiba* Linn.

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Dr. Vartika Jain
Department of Botany
University College of Science
Mohanlal Sukhadia University
Udaipur 313003, Rajasthan
India

Dr. Surendra K. Verma
Department of Medicine
Indigenous Drug Research Centre
RNT Medical College
Udaipur 313001, Rajasthan
India

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Foreword

The bio-cultural diversity of nature has gifted wide range of resources of therapeutically important ethno-medicinal plants. Presently numerous plants and their molecules have been screened and identified as natural bioactive products, which not only enrich the therapeutic compendium but also provide rich source of new pharmaceuticals, cosmetics, agrochemicals and others. The pharmaceutical industries are working on proving the benefits of various botanicals for our health and nutraceuticals for another rapidly expanding market. I found that this comprehensive treatise on *Bombax ceiba* Linn. has highlighted on the reported activities and traditional claims on this plant, which possesses immense potential as hypotensive, hypoglycemic, hypolipidemic, hepatoprotective, chemopreventive, antioxidant, fibrinolytic etc. The information presented in this volume will have a considerable impact on the pharmacological and therapeutic profile of *Bombax ceiba* Linn. The examples and evidences presented in this book strongly support the ethno-medicinal importance, quality parameters as well as the different screening profiles of this species.

It is thus of great interest to have the present book dealing with the approach that can be followed in the evaluation of therapeutic efficacy of *Bombax ceiba* Linn., which is a timely attempt of Dr. S. K. Verma and Dr. Vartika Jain to write a book on the "Pharmacology of *Bombax ceiba* Linn." I greatly appreciate their efforts and I am sure this will be very useful for all who works on development of evidences based on the claim of traditional medicine as well as to all research workers in the field of natural products.

Pulok K. Mukherjee, M.Pharm, Ph.D, FRSC
Director School of Natural Product Studies
Jadavpur University
Kolkata, India

Preface

Nature has been kind enough to humans by providing a wide range of plants having therapeutic potential. Screening of plants for isolation and identification of the natural bioactive products not only enrich the therapeutic compendium but also provide a cheaper, effective and safe alternative approach for treating diseases. It is a combined effort of botanists and clinicians for utilizing these plants for research and developing new drugs in controlling the growing epidemic of dreadful diseases such as myocardial infarction, diabetes, cancer, stroke etc. *Bombax ceiba* Linn. is one such plant species which possesses immense potential pharmacological actions. Last decade has revolutionized research on this plant showing its hypotensive, hypoglycemic, hypolipidemic, hepatoprotective, chemopreventive, antioxidant and fibrinolysis enhancing properties in various animal and human studies. This has led us towards the present compilation in order to provide a desk ready reference on everything which one needs to know about *B. ceiba*.

The present book entitled "Pharmacology of *Bombax ceiba* Linn." is a first monograph on the plant *Bombax ceiba* Linn., popularly known as Red Silk Cotton tree. It is in fact a compendium on this plant species containing total seven chapters and compiling all about *B. ceiba* starting from its historical and spiritual importance, distribution, botanical characterization and ethnobiological uses to modern phyto-pharmacy.

Bombax ceiba is well mentioned in the oldest written scriptures such as *Rigveda*, *Mahabharata* and *Ayurveda* along with a special role in many tribal cultures world wide. This handsome, deciduous tree is a part of tropical and subtropical forest ecosystem. Each part of the plant possesses immense medicinal value. A variety of chemical constituents including flavanoids, sesquiterpenoids, napthoquinones, phenols, steroids, carbohydrates and amino acids have been isolated and many are yet to be discovered. List of the phytoconstituents along with chemical structures of some important bioactive molecules is also provided in Chap. 3 for better understanding the chemistry of action. The fragmented research work done on its various biological activities in animal and human studies has been compiled in Chap. 4 with appropriate discussion. Further, toxicological profile of the plant is also discussed. Thorough analysis of its phytochemical

profile and scientifically validated phyto-pharmacological properties will lead the way for research of newer phyto-pharmaceutical molecules beneficial for human health. Therefore, this book will prove a good reference material to go through.

The plant is not only rich in its history, ethnobiology, phytochemistry and pharmacology, but also possesses immense commercial and ecological importance. Hence, special chapters on these issues are provided which will be of interest to ecologists, agriculturists, foresters, industrialists and even to common people. Furthermore, the book has also incorporated some conservation strategies along with a case report on the sustainable conservation efforts done to preserve this plant species which is rapidly declining in many parts of the world due to ignorance of its importance. All photographs incorporated in the book are original and captured by authors themselves.

It is hoped that because of its vast scope and multifaceted coverage, the book will further accelerate the speed of research on this plant in various spheres world over which will rejuvenate this plant species for the betterment of health of future generation, a tree of infernal region will become the ornamental tree of gardens, an important project of research laboratories and a source of novel phyto-pharmaceutical compound for the treatment of dreadful diseases.

Undoubtedly, there may remain some errors in the text due to ignorance or misinterpretation of some aspects of the scientific literature. Authors welcome all critical comments and suggestions in order to improve the quality of future editions.

Acknowledgments

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Dr. Vartika Jain
Dr. Surendra K. Verma

Contents

Abbreviations

ABTS	2,2′-Azino-di-[3-ethylbenzthiazoline sulphonate]
ACE	Angiotensin converting enzyme
ALT	Alanine transaminases
AST	Aspartate transaminases
ALP	Alkaline phosphatase
BMI	Body mass index
BP	Blood pressure
CCL_4	Carbon tetrachloride
COX	Cyclooxygenase
DMSO	Dimethyl sulfoxide
DNA	De-oxyribonucleic acid
DPPH	1,1-Diphenyl-2-picryl-hydrazyl
DW	Dry weight
EC	Effective concentration
ED	Effective dose
FA	Fibrinolytic activity
FAS	Fatty acid synthase
FRAP	Ferric reducing ability of plasma
g	Gram
GAE	Gallic acid equivalent
GPX	Glutathione peroxidase
GSH	Reduced glutathione
H_2O_2	Hydrogen peroxide
HAEC	Human aortic endothelial cell
HDL-C	High density lipoprotein cholesterol
HMG CoA	Hydroxymethylglutaryl coenzyme A
HUVEC	Human umbilical venous endothelial cells
IC	Inhibitory concentration
IL	Interleukin
iNOS	Inducible nitric oxide synthase
IgE	Immunoglobin E

I.P.	Intraperitoneal
I.V.	Intravenous
Kg	Kilogram
LD	Lethal dose
LDL-C	Low density lipoprotein cholesterol
LPS	Lipopolysaccharide
MIC	Minimum inhibitory concentration
n	Number of subjects
NO	Nitric oxide
NS	Not significant
OHA	Oral hypoglycemic agents
ORAC	Oxygen radical absorbance capacity
PGE	Prostaglandin E
SRB	Sulphorhoadmine B
TAS	Total antioxidant status
TBARS	Thiobarbituaric acid reactive substance
TEAC	Trolox equivalent antioxidant capacity
TLC	Thin layer chromatography
TNF	Tumar necrosis factor
TPA	12-O-tetradecanoylphorobol-13-acetate
UV	Ultraviolet
VLDL-C	Very low density lipoprotein cholesterol