

DRUMSTICK : A Miracle Health Tree

By A.K. Pandey

Agrotech Publishing Academy

DRUMSTICK

(Moringa oleifera Lamk)

A Miracle Health Tree

A.K. PANDEY

Principal Scientist

**Indian Institute of Vegetable Research
Varanasi (India)**



Agrotech Publishing Academy
Udaipur

Published by :

Mrs. Geeta Somani
Agrotech Publishing Academy
11A-Vinayak Complex-B
Durga Nursery Road, Udaipur
Mob. : 9414169635, 9413763031
Email : agrotechbooks@rediffmail.com
Website : www.agrotechbooks.com

DISCLAIMER

Information contained in this book has been published by Agrotech Publishing Academy and has been obtained by its authors believed to be reliable and are correct to the best of their knowledge. However, the publisher and its authors shall in no event be liable for any errors, omissions or damage arising out of use of this information and specially disclaim any implied warranties or merchantability or fitness for any particular use. Disputes if any, are subjected to Udaipur jurisdiction only.

Reprinted 2016

First Edition 2013
© All Rights Reserved

ISBN : (13) 978-81-8321-280-9
ISBN : (10) 81-8321-280-8

© 2011 All rights reserved. This book, or any parts there of may not be reproduced in any form without the written permission of the publisher and the consent of the author.

Typeset by :
Image Print Media, Udaipur
imageprintmedia@rediffmail.com
Contact No. : 9413467622, 2413922

Printed in India

Dedicated to

Dr. H.P. Singh

DDG (Horticulture), ICAR, New Delhi

As my tribute to Eminent Horticulture Scientist and
Well Known Planner

PREFACE

Worldwide, approximately 840 million people lack adequate amounts of food each day, and over 2 billion suffer from malnutrition, including protein-calorie and micronutrient deficiencies. Vitamin A deficiency alone affects 7 million pregnant women and 100 million children in more than 100 countries. More than 250,000 children suffer from vitamin A deficiency related disorders each year and half of them die within a year. Insufficient vegetable and fruit consumption causes 2.7 million deaths annually worldwide and belongs to the top 10 risk factors contributing to mortality. Vegetables are the primary source of micronutrients for human consumption and provide the most practical and sustainable method for alleviating micronutrient deficiencies. Most people in the world lack adequate access to vegetables and malnutrition is rampant in the tropics where per capita vegetable supplies in most countries falls far short of the minimum recommended. In sub-Saharan Africa, per capita vegetable supplies are only 43% of what are needed, leading to widespread malnutrition.

There are hundreds of plants species consumed as vegetables, but only about 20 crops are produced in intensive cropping systems. Indigenous vegetables are native to a particular region or introduced to the region from another geographical area over a long period of time. They are grown locally in a small scale, often resistant to diseases and tolerant to environmental stresses, very nutritious and contain a vast range of phyto-chemicals; however, most are neglected or under-utilized. Indigenous vegetables have potential for introduction or greater use, vegetables for daily sustenance in home gardens, and a means to diversify production systems and diets. Among the indigenous vegetables, drumstick occupies one of the important positions owing to its immense nutritional and medicinal properties. The International Plant Genetic Resources Institute has identified Moringa as a priority species of underutilized crops for food security in sub-Saharan Africa. Moringa also has been promoted by non-governmental agencies such as the Church World Service (CWS) and Educational Concerns for Hunger Organization (ECHO) to combat malnutrition among nursing mothers and infants.

Keeping above facts in view, efforts has been made to bring the publication on Drumstick. Under the Ist Chapter, an overview of the crop has been described mentioning its immense applications and research priorities to bring the crop in main stream; Chapter IInd covers the native regions of the plant *vis-a-vis* distribution of the crop across the globe; Under the 3rd Chapter, systematic details of the genus *Moringa* and its species has been given. While compiling this chapter, the author appreciates the work of Mark E. Olson, 'Ontogenetic origins of floral bilateral symmetry in Moringaceae (Brassicales)', published in *American Journal of Botany* (90: 49-71), 2003. Drumstick has emerged as one of the most nutritionally and medicinally rich crop in the plant kingdom. Its nutritional and chemical compositions have been described in IVth Chapter of the book. Recently some efforts have been made towards its genetic improvement, though not sufficient, looking the immense potential of the crop, has been described in the Chapter Vth and the Chapter VIth deals about cultivation details, post harvest management and plant protection measures. Author is well confident that the information given in the different chapters on various aspects of this miracle crop will be very useful to researchers, students, growers, exporters, NGOs and Planners and Policy Makers.

Varanasi

A.K. Pandey

ACKNOWLEDGEMENTS

Author is grateful to Dr. S. Ayyappan, Secretary, DARE, Government of India and Director General, ICAR, New Delhi for his inspiration. I am very much grateful to Dr. H.P. Singh, Deputy Director General (Horticulture) for his valuable suggestions and support. I express deep sense of gratitude and indebtedness to Eminent Vegetable Scientist Dr. Kirti Singh, Ex-Chairman, Agricultural Scientists Recruitment Board, New Delhi and Prof. G. Kalloo, Vice-Chancellor, Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur, M.P. for their unflinching supports, admirable suggestions and guidance.

The inspiration and motivation received from Dr. P.S. Naik, Director, Indian Institute of Vegetable Research, Varanasi is gratefully acknowledged. A sustained help rendered by Prof. N.C.Gautam, Ex-Vice-Chancellor, V.B.S. Purvanchal University, Jaunpur, Dr. Umesh Srivastava, Assitant Director General, (Horticulture-II) ICAR, New Delhi, Dr. B. Singh, Coordinator, AICRP (Vegetable Crops), Dr. A. B. Rai, Head, Vegetable Crop Protection, Dr. Major Singh, Head, Vegetable Improvement and Dr. P. M. Singh Principal Scientist, Indian Institute of Vegetable Research, Varanasi are duly acknowledged.

Author is thankful to Prof. L.L. Somani, Agrotech Publishing Academy, Udaipur, Rajasthan for giving the consent for publication and to bring the manuscript in the present form. Painstaking effort made by Ms. Priti Khemariya in reading the manuscript and Mr. Deepak Vishwakarma in word processing deserves appreciation.

Author

ABOUT THE BOOK

The book Drumstick (*Moringa oleifera* Lamk) covers the valuable information on various aspects of a nutritionally laced and medicinally rich but underutilized plant *Moringa*. While compiling this book, recent information has been given towards its immense applications in human nutrition, medicinal applications and industrial uses which beckon the attentions of researchers to bring this crop in main stream. Information regarding its rich diversity describing native regions of the plant *vis-a-vis* distribution in Africa and other parts of the world given in the book will be of immense use to breeders who are engaged in its genetic improvement. This piece of the literature seems to be the first in world deals systematic details of the genus *Moringa* and its several wild species. In recent past, as the plant has emerged as one of the most nutritionally and medicinally rich crop in the plant kingdom, its nutritional and chemical compositions have also been described in the book. Looking the immense potential of the crop, recently some efforts have been made towards its genetic improvement; same has been highlighted in the book. Prevailing agronomic practices to raise the crops, post harvest management and plant protection measures have also been mentioned. Author is well confident that the information given in the different chapters on various aspects of this miracle crop will be very useful to researchers, students, growers, and exporters, NGOs and Planners and Policy Makers.

ABOUT THE AUTHOR

Dr. A.K. Pandey is Principal Scientist at Indian Institute of Vegetable Research, Varanasi. He is ARS Scientist of 1985 batch. Dr. Pandey obtained his M.Sc. (Ag.) and Ph.D. degree in Horticulture from C.S. Azad University of Agriculture and Technology, Kanpur. He participated in the 1st International Post Graduate Course on Protected Agriculture in Arid and Semi-arid Region at Hebrew University, Jerusalem, Israel. He has published more than 70 research papers, 65 popular articles and review articles in journals of national and international repute. Dr. Pandey till date has written 8 books (i) *Bharat mein Sabji Utpadan : Pramukh Kismein evam Vikas Ki Taknike* (ii) *Grih Vatika evam Hamara Swasthya*, (iii) *Pattivali Sabjiya* (iv) *Alpupyogi Sabjiya*, (v) *Nai Sajiya* (vi) *Underutilized Vegetable Crops* (vii) *Dalhani Sabjiya* and (viii) *Aquatic Vegetables*. Dr. Pandey is a prolific writer and he has received several awards and honours for his distinguished academic contribution. Defence Research and Development Organization (DRDO), Ministry of Defence, Government of India bestowed the honour by giving him first prize of Rajbhasa Puraskar on his book *Bharat mein Sabji Utpadan : Pramukh Kismein evam Vikas ki Taknike*. Ministry of Home Affairs, Department of Official Language, Government of India conferred the honour by giving him *Rajbhasa Puraskar* for 2003-04 under National Award Scheme for original book writing on *Gyan-Vigyan* on his book *Grih Vatika evam Hamara Swasthya*. Defence Research and Development Organization (DRDO), Ministry of Defence, Government of India second time conferred him *Rajbhasa Puraskar* on his book *Pattivali Sabjiya*. Recently, Hon'ble President of India has conferred him *Rajiv Gandhi Gyan-Vigyan Puraskar*. Dr. Pandey is a member on board of a number of scientific societies and academic panels. He is a Member of Editorial Board of Indian Society of Vegetable Science (ISVS), Varanasi and Member of Editorial Board of Annals of Horticulture, Hi-Tech Horticulture Society, Meerut, Uttar Pradesh.

Contents

Preface	4
About the Book	5
About the Author	6
Chapter-I	
Introductory Consideration	11-21
<i>Drumstick for combating the malnutrition</i>	11
<i>Processing and processed products</i>	12
<i>Drumstick - a single plant with numerous products</i>	14
<i>Potential to thrive in difficult areas</i>	15
<i>Application in varied branches of medicine</i>	15
<i>Drumstick - a plant with full of phyto-chemicals</i>	16
<i>Global Research Efforts to tap the vast potential of drumstick</i>	19
Chapter-II	
Origin and Distribution	22-31
<i>Area and production</i>	23
<i>Nomenclature</i>	24
<i>Native range of Moringa</i>	26
Chapter-III	
Taxonomy and Botanical Description	32-59
<i>A synopsis of Family Moringaceae</i>	32
<i>Botanical Description of Family Moringaceae Dum.</i>	35
<i>Habit and habitat</i>	35
<i>Leaves</i>	35
<i>Stem</i>	35
<i>Inflorescence and flowers</i>	36
<i>Androecium</i>	36
<i>Gynoecium</i>	36
<i>Fruit</i>	37

<i>Genus Moringa</i>	38
<i>Key to species of Moringa</i>	41
<i>Floral anatomy and ontogenetic study of Moringa species</i>	41
<i>Actinomorphic</i>	41
<i>Zygomorphic</i>	42
<i>Inflorescence structure</i>	42
<i>Variation in floral plan</i>	44
<i>Floral ontogeny: stages</i>	45
<i>Phase (I) Organogenesis</i>	45
<i>Phase (II) Early differentiation</i>	46
<i>Phase (III) Late differentiation</i>	46
<i>Phase (IV) Enlargement</i>	48
<i>Anthesis</i>	50
<i>Classification of Moringa species on the basis of geographical distribution and plant ideotypes</i>	51
<i>(I) Bottle trees</i>	51
<i>(II) Slender trees</i>	52
<i>(III) Trees, shrubs and herbs of N.E. Africa</i>	52
<i>Moringa Diversity in Africa</i>	53
<i>Description of important species</i>	53
<i>Morphological Description of Moringa oleifera</i>	56
<i>Anatomy of bark and wood of drumstick</i>	59
<i>Anatomy of flower</i>	59
<i>Floral biology</i>	59
Chapter-IV	
Composition and Uses	60-95
<i>Nutritional composition of leaves</i>	62
<i>Drumstick leaf powder</i>	66
<i>Nutritional composition of flower</i>	68
<i>Drumstick gum</i>	69
<i>Nutritional composition of drumstick seed</i>	69
<i>Phytochemistry</i>	72
<i>Anti- nutritional factors</i>	74
<i>Psychopharmacological actions of drumstick</i>	74
<i>Pharmacognosy and anecdotal</i>	74
<i>Medicinal Uses</i>	74

Drumstick : A Wonder Health Tree



Publisher : Agrotech
Publications

ISBN : 9788183212809

Author : Pandey AK

Type the URL : <http://www.kopykitab.com/product/7167>



Get this eBook