



# MILLETS

## MAGICAL CROPS

EDITORS

**Dr. Shilpi Sharma**

**Dr. Payal Jain**



Volume-II

**Kripa Drishti Publications, Pune.**



# MILLETS

## MAGICAL CROPS

### Editors

#### **Dr. Shilpi Sharma**

Head, Associate Professor,  
School of Allied Health Sciences,  
Jaipur National University,  
Jaipur, Rajasthan, India.

#### **Dr. Payal Jain**

Assistant Professor,  
Department of Food and Nutrition,  
School of Science and Technology,  
Vanita Vishram Women's University,  
Surat.

**Kripa-Drishti Publications, Pune.**

Book Title: **Millets Magical Crops**

Edited By: **Dr. Shilpi Sharma, Dr. Payal Jain**

**Volume –II**

**Price: ₹450**

ISBN: **978-81-19149-12-4**



Published: **August 2023**

**Publisher:**



**Kripa-Drishti Publications**

A/ 503, Poorva Height, SNO 148/1A/1/1A,  
Sus Road, Pashan- 411021, Pune, Maharashtra, India.

Mob: +91-8007068686

Email: [editor@kdpublishations.in](mailto:editor@kdpublishations.in)

Web: <https://www.kdpublishations.in>

© **Copyright Dr. Shilpi Sharma, Dr. Payal Jain**

All Rights Reserved. No part of this publication can be stored in any retrieval system or reproduced in any form or by any means without the prior written permission of the publisher. Any person who does any unauthorized act in relation to this publication may be liable to criminal prosecution and civil claims for damages. [The responsibility for the facts stated, conclusions reached, etc., is entirely that of the author. The publisher is not responsible for them, whatsoever.]

## **PREFACE**

I am delighted to present to you the second book in this series, and I am filled with a sense of pride and accomplishment as I reflect upon the journey that led me here. This book builds upon the foundation laid by its predecessor, aiming to delve even deeper into the subject matter and offer fresh perspectives to its readers.

Throughout this journey, I have been fortunate to have the unwavering support of my loved ones, and it is only fitting that I express my heartfelt gratitude to them. First and foremost, I would like to acknowledge my husband, who has been my rock, my confidant, and my constant source of encouragement. His belief in my abilities and his unwavering support have fueled my determination to pursue my passion and put my thoughts into words.

To my children, I am eternally grateful for their patience, understanding, and unwavering love. Their presence has brought joy and balance to my life, and their inquisitive minds have reminded me of the importance of curiosity and learning. They have been my inspiration and have taught me invaluable lessons about resilience, growth, and the pursuit of knowledge.

I am also deeply indebted to my parents, who instilled in me a love for learning and a thirst for knowledge from a young age. Their sacrifices and unwavering belief in my abilities have laid the foundation for my achievements. Their wisdom, guidance, and unconditional love have shaped me into the person I am today, and I am forever grateful for their unwavering support.

Thank you for accompanying me on this exciting and fulfilling journey. May this book serve as a catalyst for growth, a source of inspiration, and a testament to the power of ideas.

With deep gratitude,

**Dr. Shilpi Sharma**

## *Dedication*

To my parents and my loving husband,

This book is a testament to the unwavering support, boundless love, and endless encouragement you have showered upon me throughout my journey. You have been my pillars of strength, my guiding lights, and the foundation upon which I have built my dreams.

To my parents, who nurtured me with boundless affection, instilled in me the values of perseverance and determination, and taught me to believe in myself, thank you for always believing in my potential. Your sacrifices and unwavering belief in me have been the driving force behind my accomplishments.

To my beloved husband, who has stood by my side through thick and thin, offering unwavering support, gentle reassurance, and an unwavering belief in my abilities, thank you for being my constant source of inspiration and for reminding me of my strength even in the face of adversity.

Your love and encouragement have propelled me forward, giving me the courage to pursue my passions and to embrace the challenges that come with them. Without your unwavering support, this book would not have come to fruition.

With heartfelt gratitude, I dedicate this book to you, my parents and my loving husband. May these words serve as a token of my love and appreciation for everything you have done and continue to do for me. Your presence in my life is an immeasurable gift, and I am forever grateful.

With all my love,

**Dr. Shilpi Sharma**

*A word of gratitude (Acknowledgement)*

***“I owe my life to my parents, my husband and my daughter for living, but my teachers ushered me to the brave world of knowledge”***

*This book is an endeavor spanning years of work with facets that necessitated cohabitation and cooperation by scores of people. Thus, I owe gratitude to all who helped me in taking this study effort to a logical conclusions. This acknowledgement is an opportunity to convey my indebtedness to all the people who inspired, guided and helped me in preparing this manuscript. I sincerely express my thankfulness to my parents, husband, daughter for providing me the academic environment for taking up this huge and creative task of editing this innovative book. I extend my heartfelt thanks to **Dr. Shilpee Sharma**, Head, Associate Professor, Jaipur National University for motivating me for this task of editing book.*

*There is a long list of friends who really mattered a lot, being inexhaustible source of positive energy. Above all, I would like to thank my friends **for their endless support.***

*I would be amiss, if I don't acknowledge the support that I received from **Kripa Drishti Publication** for their academic support.*

*Last but not the least, with deep sense of gratitude I bow down my head before **‘Lord Mahaveer’** whose everlasting Kripa made me inch towards my destination.*

**Dr. Payal Jain,**

Assistant Professor,  
Department of Food and Nutrition,  
School of science and Technology,  
Vanita Vishram Women's University, Surat.

# CONTENT

<b>1. Global Scenario of Millets - Divyani Rathore .....</b>	<b>1</b>
1.1 Introduction: .....	1
1.2 History: .....	1
1.3 Production: .....	3
1.4 Productivity Constraints: .....	4
1.5 Consumption: .....	4
1.6 International Market: .....	6
1.7 Conclusion: .....	7
1.8 References: .....	8
<b>2. Millets as A Superfood - Shariya Fatima, Dr. Shilpi Sharma .....</b>	<b>10</b>
2.1 Introduction: .....	10
2.2 Advantages of Millets: .....	11
2.3 Different Types of Millets: .....	12
2.3.1 Finger Millet ( <i>Eleusine Coracana L.</i> ): .....	12
2.3.2 Pearl Millet ( <i>Pennisetum Glaucum</i> ): .....	12
2.3.3 Sorghum: .....	12
2.3.4 Foxtail Millet- ( <i>Setaria Italica</i> ): .....	12
2.3.5 Proso Millet ( <i>Panicum Miliaceum</i> ): .....	13
2.3.6 Barnyard Millet ( <i>Echinochloa Frumentacae</i> ): .....	13
2.3.7 Kodo Millet ( <i>Paspalum Scrobiculatum</i> ): .....	13
2.4 References: .....	13
<b>3. Nutritional Aspects and Health Benefits of Millets - Dr. Vineeta Bansal ....</b>	<b>15</b>
3.1 Introduction: .....	15
3.2 Nutritive Value of Millets: .....	15
3.3 Individual Description of Millets: .....	19
3.4 Health Benefits of Millets: .....	20
3.5 Conclusion: .....	21
3.6 References: .....	21
<b>4. Nutrient Composition &amp; Health Benefits of Millets - Dr. Ketki Mungi.....</b>	<b>22</b>
4.1 Nutrient Composition of Millets: .....	22
4.1.1 Fiber: .....	22
4.1.2 Protein: .....	23
4.1.3 Minerals: .....	23
4.1.4 Fat: .....	24
4.1.5 Vitamin: .....	24
4.1.6 Antioxidants: .....	24

4.2 Health Benefits of Millets:.....	26
4.2.1 Improved Blood Sugar Control: .....	26
4.2.2 Weight Management: .....	26
4.2.3 Promotes Gut Health: .....	27
4.2.4 Helps Manage Inflammation: .....	27
4.2.5 Enhances Heart Health: .....	28
4.3 Bibliography: .....	28
<b>5. Millets Boon for Celiac Subjects - Aascharya Srivastav and Komal Ojha .....</b>	<b>29</b>
5.1 Introduction:.....	29
5.2 Millets:.....	29
5.3 Celiac Disease: .....	30
5.4 Gluten: .....	30
5.5 "Millets Boon for Celiac Subjects": .....	30
5.6 Conclusion: .....	31
5.7 References:.....	32
<b>6. Contribution of Mighty Millets in Holistic Health - Dr. V. Bhavani.....</b>	<b>34</b>
6.1 Introduction:.....	34
6.2 Jowar:.....	34
6.3 Pearl Millet:.....	35
6.4 Finger Millet: .....	37
6.5 Foxtail Millet:.....	39
6.5.1 Method to cook Foxtail Millet:.....	40
6.6 Barnyard Millet: .....	42
6.7 Little Millet: .....	44
6.7.1 Method of Preparation of Little Millet:.....	44
6.8 Proso Millet:.....	45
6.9 References:.....	46
<b>7. Nutritional Aspects and Health Benefits of Millets - Ms. Priyanka Sharma, Dr. Shilpi Sharma.....</b>	<b>47</b>
7.1 Introduction:.....	47
7.2 Health Benefits of Millets:.....	48
7.3 Balances your Blood Glucose Levels:.....	49
7.4 Aids in Weight Loss: .....	49
7.5 Keeps Your Heart in Good Shape: .....	50
7.6 Battles Cancer Cells: .....	50
7.7 Promotes Digestion: .....	50
7.8 Gives Stronger Bones: .....	50
7.9 Strengthens Your Cardiovascular System: .....	50
7.10 Acts as an Agent for Anti-ageing:.....	50
7.11 Millet Nutritional Facts:.....	50
7.12 Types of Millet: .....	51



7.13 References:.....	52
<b>8. Nutritional Profile of Different Millets - Navita Pareek, Srishti.....</b>	<b>55</b>
8.1 Introduction:.....	55
8.2 Different Types of Millets: .....	56
8.3 Nutritional Profile:.....	56
8.4 Conclusion: .....	59
8.5 References:.....	59
<b>9. Significance of Millets in Health and Diseases - Srishti, Navita Pareek .....</b>	<b>61</b>
9.1 Introduction:.....	61
9.2 Obesity: .....	62
9.3 Diabetes: .....	62
9.4 Cardiovascular Diseases: .....	63
9.5 Gastrointestinal Disorders:.....	63
9.6 Celiac Disease: .....	64
9.7 Cancer: .....	64
9.8 Conclusion: .....	64
9.9 References:.....	65
<b>10. Strategies for Mainstreaming Millets: Enhancing Food Security and Diversifying Diets - Ms. Yashaswani, Dr. Sanjay Bhayana .....</b>	<b>67</b>
10.1 Millets in Human Diets Through History:.....	67
10.2 Current Status of Millets in The Global Food Systems:.....	68
10.3 The Rise of Millets: From Forgotten Crop to Superfood: .....	68
10.4 Environmental Sustainability Through the Adoption of Millets:.....	70
10.5 Millets as India's Superfood for Economic Growth: .....	71
10.6 Future Directions and Conclusion: .....	72
10.7 References:.....	73
<b>11. Embracing Millets Diet for Optimal Well-Being Over Gluten Free Diet - Dr. Payal Jain, Dr. Lalita Charan .....</b>	<b>75</b>
11.1 Introduction:.....	75
11.2 Gluten Related Disorders:.....	75
11.2.1 Celiac Disease:.....	76
11.2.2 Non-Celiac Gluten Sensitivity (Gluten Sensitivity):.....	77
11.2.3 Wheat Allergy:.....	77
11.2.4 Dermatitis Herpetiformis:.....	77
11.2.5 Gluten Free Diet:.....	77
11.3 Millets: .....	78
11.3.1 Millets for Gluten Related Disorders: .....	80
11.4 Summary:.....	82

<b>12. Millets Boon for Celiac Subjects – Ms. Deepika Sharma, Dr. Shilpi Sharma</b>	<b>83</b>
12.1 Introduction:.....	83
12.2 Definition and Types:.....	83
12.3 Nutritional Benefits:.....	84
12.4 Millets and Celiac Disease:.....	84
12.4.1 Gluten-Free Nature:.....	84
12.4.2 Digestive Health:.....	84
12.5 Culinary Uses and Millet-Based Recipes:.....	85
12.5.1 Millets in Baking:.....	85
12.5.2 Millets in Main Courses:.....	85
12.6 Tips for Including Millets in The Diet:.....	85
12.6.1 Varied Millet Consumption:.....	85
12.6.2 Proper Cooking Techniques:.....	85
12.7 Conclusion:.....	86
12.8 References:.....	86
<b>13. Millets: The Miracle Grains – Dr. Ankita Sharma</b>	<b>87</b>
13.1 Introduction:.....	87
13.2 Anti-Nutritional Factors:.....	91
13.3 Conclusions:.....	93
13.4 References:.....	93
<b>14. Entrepreneurship Development Promotion Through Millet Processing - Ms. Sneha Sarkar, Dr. Aditya Lama</b>	<b>94</b>
14.1 Introduction:.....	94
14.2 The Establishment of Supply Networks for Nutrient-Rich Millets:.....	97
14.3 Enhanced SHG Income with an Entrepreneurship Development Programme Focusing on the Value Addition of Millets Products:.....	97
14.4 Conclusion:.....	99
14.5 Reference:.....	100
<b>15. Fasting Millets: Superfoods - Yamini Chaturvedi</b>	<b>102</b>
15.1 Introduction:.....	102
15.2 Benefits of Millets:.....	102
15.3 Different Types of Millet:.....	103
15.3.1 Little Millet or Sama (Barnyard millet):.....	103
15.3.2 Amaranth Millet:.....	104
15.3.3 Buckwheat Millet:.....	105

<b>16. Millets: An Alternative Source of Plant Protein - Dr. Neetu Dobhal, Dr. Deepa Joshi .....</b>	<b>106</b>
16.1 Introduction: .....	106
16.2 Millet-Based Proteins: .....	107
16.3 Methods of Millet Protein Extraction: .....	109
16.4 Applications of Millet Proteins: .....	111
16.5 Conclusion: .....	112
16.6 References: .....	113
<b>17. Utilization of Millets in Weaning Foods - Pooja Bafila, Gita Bisla .....</b>	<b>116</b>
17.1 Introduction: .....	116
17.2 Nutritional and Nutraceutical Potential of Different Millets those can be Used for Complementary Foods: .....	119
17.2.1 Barnyard Millet: .....	119
17.2.2 Finger Millet: .....	120
17.2.3 Pearl Millet: .....	120
17.2.4 Foxtail Millet: .....	120
17.2.5 Proso Millet: .....	121
17.2.6 Little Millet: .....	121
17.2.7 Kodo Millet: .....	121
17.2.8 Sorghum: .....	121
17.3 References: .....	122
<b>18. Millets: Beneficiary Towards Celiac Patients - Ms. Samadrita Nag, Dr. Shilpi Sharma.....</b>	<b>128</b>
18.1 Introduction: .....	129
18.2 Nutritional Benefits of Millets: .....	129
18.2.1 The Main Nutritional Benefits of Millet are: .....	129
18.3 Millets and Celiac Disease Management: .....	130
18.3.1 Gut Health: .....	131
18.3.2 Versatility While Cooking: .....	131
18.3.3 Satiety and Blood Sugar Control: .....	131
18.4 Culinary Applications and Versatility: .....	131
18.5 Some Types of Millet: .....	131
18.5.1 Gluten-Free Alternatives: .....	132
18.5.2 Nutritional Powerhouse: .....	132
18.5.3 Whole Grains: .....	132
18.5.4 Delicious Breakfast: .....	132
18.5.5 Baking and Desserts: .....	132
18.5.6 Thickener: .....	132
18.5.7 Fermented Form: .....	133
18.5.8 Drinks: .....	133
18.6 Conclusion: .....	133

18.7 References:.....	133
<b>19. As A Super Food, Millets - <i>Dr. Neeta Chaudhari</i>.....</b>	<b>134</b>
19.1 Definition: .....	134
19.2 Health Advantages: .....	135
19.3 Different Millets:.....	136
19.4 Millets' Proven Health Benefits: .....	137

## ABOUT THE EDITORS



**Dr. Shilpi Sharma** is a Head, Associate Professor at the School of Allied Health Sciences, Jaipur National University, Jaipur (Rajasthan). She has been groomed in the academic environs of Rajasthan Agriculture University, Bikaner, obtaining her B.Sc. Home Science, M.Sc. Foods and Nutrition degree from the Banasthali Vidyapith (Rajasthan) and Ph.D. from Maharana Pratap University of Agriculture and Technology, Udaipur. She also qualified ASRB NET. A first division holder throughout her academic career and medalist in Ph.D. Her Ph.D. research work

was funded by DST, Rajasthan. She has been teaching Foods and Nutrition at the undergraduate and postgraduate levels for over 18 years. She has been guided Ph.D. scholars and many M.Sc. filed project and dissertations. She has published more than 15 papers in journals indexed in Scopus/Web of Science/UGC-CARE and many Book Chapters with National Publishers. She also Chair and Co-chair scientific session in international conferences. She also delivered Invited Talk in National and International Conferences.



**Dr. Payal Jain** is currently working as an Assistant Professor in the Department of Food and Nutrition, School of Science and Technology, Vanita Vishram Women's University, Surat, is having M.Sc. degree in Food and Nutrition from Banasthali University with First class and worked on development of sports drinks for athletes on her credit as a part of M.Sc. dissertation. Dr. Payal Jain has done her PhD in Food Science and Nutrition from Banasthali Vidyapith, Jaipur, Rajasthan in the area of Geriatric Diabetology. She has teaching experience of 13 years with various work places

viz., Jaipur, Tonk, Dehradun, Surat respectively. She has chaired two scientific sessions at 2 national conferences at Goa and Surat. She has coordinated various workshops, entrepreneurial programmes, nature club programmes under her guidance. She has 30 publications at national and international levels on her credit. She has presented papers at many national and international conferences and seminars on health and nutrition. Dr. Jain is appointed as a District Nutritional Partner in District Development office, Surat. She has recently published a Textbook on Community Nutrition and Maternal and Child Nutrition with Prism publication. Dr. Jain also published a research paper in Scopus indexed journal in the year 2022-23. She has also supervised 16 dissertations for Post graduation students. She also served as an External Examiner in various National University, India.



**KRIPA DRISHTI  
PUBLICATIONS**

Kripa-Drishti Publications  
A-503 Poorva Heights, Pashan-Sus Road, Near Sai Chowk,  
Pune - 411021, Maharashtra, India.  
Mob: +91 8007068686  
Email: editor@kdpublications.in  
Web: <https://www.kdpublications.in>

Price: ₹ 450

ISBN: 978-81-19149-12-4



9 788119 149124