

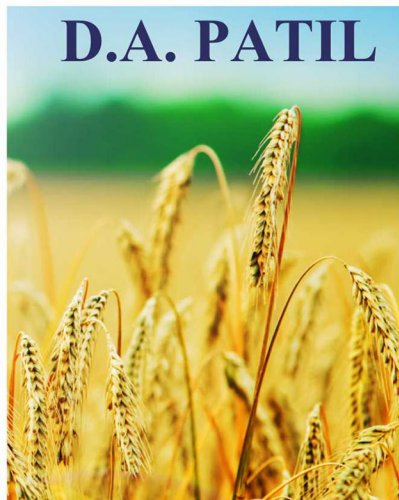


FOOD CROPS

Evolution, Diversity
and Advances



D.A. PATIL



Food Crops: Evolution, Diversity and Advances

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Food Crops:

Evolution, Diversity and Advances

By

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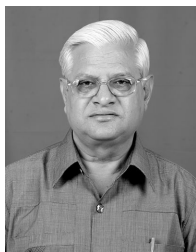
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TO**



**THE INDIAN FARMERS
FOR SHOULDERING SILENTLY
THE WHEEL OF NATIONAL PROGRESS,
PRESTIGE AND FUTURE.**

About Author



Dr. D.A. Patil did his M.Sc. and Ph.D. in Botany from Dr. B.A. Marathwada University (Aurangabad, M.S.) with Angiosperms as a subject of specialization in 1978 and 1983 respectively. He has about 34 years of research and teaching experience at graduate and post-graduate classes. His major research interest includes Taxonomy of Angiosperms, Anatomy, Floristics, Ethnobotany, Medicinal Plants and Etymology. He has authored (i) Flora of Dhule and Nandurbar Districts (Maharashtra) (2003), (ii) Origins of Plant Names (2007), (iii) Useful Plants : Origin, History & Civilization (2008), (iv) Herbal Cures: Traditional Approach (2008), (v) Medicinal Plants : History, Culture and Usage (2010), (vi) A Key To The Angiospermic Families of North Maharashtra (1992), (vii) Flora of Jalgaon District (Maharashtra) (2008), (viii) Ethnobotany of Nasik District (Maharashtra) (2006), (ix) Ethnobotany of Jalgaon District (Maharashtra) (2008), (x) Ethnobotany of Buldhana District (Maharashtra) (2010), (xi) Spices And Condiments: Origin, History & Applications (2013), (xii) Herbal Materia Medica of Maharashtra (2013). (xiii) Ethnobotany of Badwani District (Madhya Pradesh) (2016) and (xiv) Maharashtratil Aushadhi Vanaspati Sangrah (In Marathi) (2016). He has also edited proceedings (i) Plant Diversity and Biotechnology (2005), (ii) Biodiversity, Sustainable Development and Human Welfare (2010), (iii) Biodiversity and Environmental Crisis: Past, Present & Future (2013). He has 335 research papers to his credit published in national, international journals and journals of CSIR, India. Apart from his participation in several national and international conferences and symposia in India and abroad, many students in botany received his guidance for Ph.D. and M.Phil. degrees. He is member of Editorial Boards of six national journals and acted as a referee for Ph.D. and M.Phil. degrees for other universities. He has been awarded (i) Dr. M.S.Swaminathan Award (1996) by Indian Botanical Society, (ii) Scientist of The Year 2004 by National Environmental Science Academy,

(iii) Jivaka Ayurved Vishwa Sanman (2006) by International Academy of Indian Medicine, (iv) Lifetime Achievement Award-2007 for Health and Education by Health & Education Development Association. (v) Best Teacher Award-2010 by S.S.V.P.Sanstha, Dhule (MS) India. (vi) Talented Scientist Award-2012, Awarded at 4th International Conference on Medicinal Plants and Herbal Products, Johns Hopkins University and The George Washington University, (USA). (vii) Mahatma Jyotirao Phule National Best Teacher Award-2013, awarded by Dr.Panjabrao Deshmukh Shikshak Parishad (M.S.), India. (viii) Shri Gurudeo Mahalingdas Ahirrao Award-2012 by Shri Gurudeo Mahalingdas Ahirrao Dyanprabodhini, Wade (M.S., India), (ix) Award for excellence in Research-2013 by Education Expo (TV), Research & Branding Company at Bangalore, and (x) Eminent Botanist Award-2013 by organizing committee for National Conference on "Recent Emerging Trends in Plant Sciences-2013 at PSGVP Mandal's Arts, Science and Commerce College, Shahada (M.S., India). Recently, he is awarded a prestigious Prof. V. Puri Award-2014 by Indian Botanical Society in recognition of his significant contribution in the field of Taxonomy. He is Ex-Dean, Faculty of Science, North Maharashtra University (Jalgaon, M.S.) during 2000 to 2005 and also Ex-Chairman, Board of Studies in Botany of the same university during 2000 to 2005 and 2010 to 2015. He is a member of many prestigious academic and scientific bodies and societies. He also contributes for Marathi daily newspapers and creates interest in plants by delivering talks especially for younger generation. He also headed his college as Professor and Principal.

Preface

On account of superior intellect, an average man thinks himself not a part of the ambient organic world. He is ignorant that he is absolutely dependent on other organisms, whether plants or animals, for his very existence on this blue planet. Nay, he is a guest of green plants which utilize sunlight through the process of photosynthesis. This process and the plants are still to be realized and appreciated widely. Lord Buddha had gone ahead of this aspect and stated that plants afford protection to all beings, offering shade even to the axeman who destroys it. We all are surrounded by the plant world. Some of them, particularly very useful for our life, are cultivated by us for immediate help, but we do not extend any effort to understand them in right perspective. Naturally some questions strike to human mind. What is the native of cultivated plants? What are their ancestors and from where they brought in our vicinity? How and when they reach to us? Some intellectuals have endeavored to attend these questions. It was Alphonse De Candolle (1883) who attempted to decide place and period of cultivated plants based on conclusions on a variety of evidence such as earlier works of pioneers (Theophrastus, Dioscorides, etc.), historians, ancient writings, archaeological remains, ethnological and philological data (from ancient languages Hebrew, Sanskrit, etc.), ancient monuments, etc. Another milestone work on this line was done by N.I. Vavilov (1922). He based his conclusions on anatomy, genetics, cytology, distribution and plant diseases, etc. According to him, some crop plants had a diversified rather than a single origin. Interestingly, he explained origin of some cultivated species from weeds *e.g.* rye, oats. He concluded that the great centres of distribution of cultivated plants were always in mountainous regions, and the greatest amount of diversity occurred in such areas.

The most essential need of mankind is food which primarily comes from plants in the form of cereals, millets, pseudocereals, pulses (legumes), fruits, vegetables, sugar, starch and oil yielding plants. To meet an ever-increasing demand, an application of

man's know-how about plants is of great importance for better utilization of plant products. To meet his requirements, man has endeavored to tap plants as sources for his varied uses and comfort by exploiting his scientific knowledge. He has been successful on this path to a greater extent. But he has to work more because of ever growing human population and a great variety of demands.

Plants are studied for utilitarian (applied) and philosophical (basic) point of view. Both aspects are essential for the progress of plant science and to ease the sufferings of man. Plants are considered, for convenience, in various compartments like agriculture, horticulture, medicine, economic botany, ethnobotany, etc. Plants are thus learned or taught touching usually a single compartment. Inter-connections between these are usually ignored while framing syllabi of universities and academic bodies. Study of plants incorporating various fields or disciplines of study and research is not usually the aim of such syllabi. Hardly, there are books or treatises based on different footings. This book will familiarize the history of plant introductions. The movement of plants about the world by man is the most practically important results of botanical study and has had economic, cultural and political results on a world scale. These facts must be revealed to kindle the readers. The present author has made a headway in this direction by presenting this book to render the readers broad-based. This will not allow one to think plants in isolation. The present account has mainly focused food crops. A careful attempt has been also made to include the underutilized crop plants of the world belonging to the aforesaid group of crop plants. This will help reveal the complete history and development of the world crops.

The idea of writing a book on crop plants struck to my mind while surveying flora and agrobiodiversity especially in northern part of Maharashtra State (India). The tribal farmers and rurals revealed me not only the diversity of crops but also crop species usually unknown to urban elites and even teachers in botany. I was fully impressed above all else with the wealth of plant materials of great interest. Some crop species were exotic, while others were indigenous but underutilized. I also feared that these underutilized crop species will be, with time, forgotten because

of the fast rate of acculturation in Indian tribal and rural societies. I, therefore, extended my study particularly selecting to crops especially focusing food yielding plants. This gave a chance to know and reveal the state of knowledge of these important groups of crops particularly from the standpoint of agrobiodiversity, their evolution and emphasis vis-à-vis negligence on them by the present human societies.

This treatise is designed principally for tertiary education in Botany, Agriculture and Food Science keeping in view all worldwide universities. Major part of it is scientific while other aspects such as archaeology, history, warfare, rulers, travelogues, ethnology, ancient treatises or writing, religious treatises, study of various languages, geography, etc. are also dilated wherever found necessary. In these aspects, technical language is obviously kept minimum. Research development for each crop species has been conveniently divided into history and further developments. An attempt has been particularly made to provide relevant bibliography separately for each crop so that it can be useful to the researchers in these fields of study and render this treatise useful as a reference book. It includes ancient as well as recent developments in the said sciences and disciplines. Nomenclature is updated, except those referred originally in research works to avoid further nomenclatural chaos.

I wish to extend my humble thanks to Shri Shivaji Vidya Prasarak Sanstha for library facilities, and Agricultural Universities and colleges in the state of Maharashtra for the same. I am thankful to my most revered teacher Professor R.M. Pai (Dr. B.A. Marathwada University, Aurangabad, Maharashtra, India) for his ever guiding force to continue study even after my retirement from active service. All members of my family endured the many occasions that I have been forced to ignore during the gestation of this treatise.

Place : **Dhule** (Maharashtra)

Date : 13/09/2018

Dr. D.A. Patil

About the Book

Food Crops: Evolution, Diveristy and Advances

The treatise presents a wide range of information on different facets of world food crops. It justifies the present state of knowledge with reference to crop history, initial and latest develop-ments with evolutionary approach based on karyotaxonomic and geographical evidence. The author has endeavored to dilate attempts for crop domestication and cultivation by worldwide human societies. These are supported by various considerations like ethnology, philology, ancient and religious treatises, archaeological evidence, works of pioneers, various human affairs, etc. He further based his writing on botanical conclusions accrued from distribution, number of varieties, occurrence of wild types, agro-botanical characteristics, time and place of origin, and worldwide usage of each crop species.

The treatise is a highly-acclaimed source of information of crop plants useful to degree and post-graduate students of botany, agriculture and food science as a main text and reference work for researchers. It is recommendable for use in any country especially in the English speaking world. It will also appeal to the general reader, being rich in contents.

In a nutshell, this treatise is a history of development of food crops. And therefore, a humble attempt has been made, first, to ascertain what was actually done or said, and second, to emphasize the causes of success or failure. Truly, it is the study of causes that makes history more fruitful and a basis for evaluating the future events with confidence.

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