

Advances in Poultry Processing & Food Safety

Presently in India, poultry and poultry products have become most important food in the diet. Information on the advances in science and technology of poultry products processing is essential to the academia, government and industry personnel. This book provides an extensive description of poultry processing, the latest advances in technologies, manufacturing processes, and control of safety and quality during processing. This book contains 22 chapters covering wide areas of poultry processing and food safety including the status of poultry and egg industry, health benefits of poultry meat consumption, nutritional manipulations for production of health promoting poultry products, application of biotechnology in both poultry production and poultry meat processing, advances in both primary, further processing and packaging of poultry and poultry products, development of functional poultry products, quality assurance of poultry and poultry products, utilization of poultry byproducts and waste management, drug residues in poultry meat, GMP, HACCP and SPS measures applicable to poultry processing and standards and regulations of poultry processing. The book will be very useful for PG students related to meat and poultry processing, researchers, academician, industry and government personnel.

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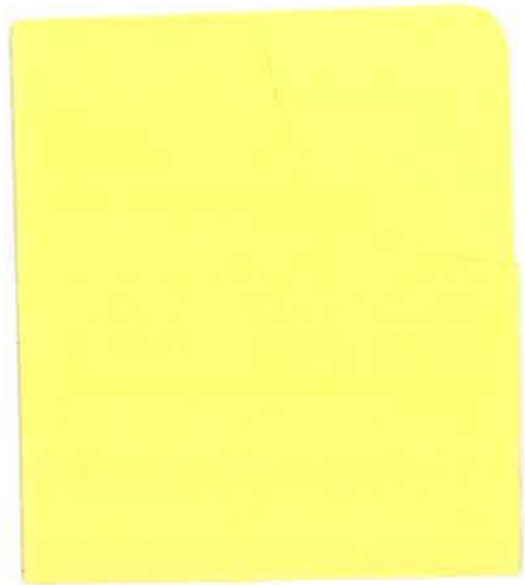
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About the Authors



Dr. G. Vijaya Bhaskar Reddy was born in Andhra Pradesh, completed BVSc & A.H. in the year of 2006, MVSc and Ph.D. majoring in Livestock Products Technology from Sri Venkateswara Veterinary University (SVVU), Tirupati, Andhra Pradesh in 2008 and 2011 respectively. He was awarded with Gold Medal for securing highest OGPA at University level during his Master's Programme.

He was a recipient of IMSA-Allanasons **Young Scientist Award** sponsored by Indian Meat Science Association (IMSA) in 2016. He is presently working as an Assistant Professor and Head at Department of Livestock Products Technology, College of Veterinary Science, SVVU, Tirupati.

Dr G. Vijaya Bhaskar Reddy is teaching several UG and PG courses related to Livestock Products Technology and guiding MVSc., students in the capacity of chairman and advisory committee member. He has authored various UG and PG manuals which was approved by University for uniform implementation of various constituent colleges of SVVU. He has attended **Three months overseas training programme** on "Assuring Microbial Safety of Poultry and Poultry Products in the Value Chain" at Department of Poultry Science, College of Agricultural and Environmental Sciences, University of Georgia, Athens, Georgia, USA in 2019.

He is engaged in research on Meat Science and Technology since 2008 and his main research achievements are development of plant based, egg based and dairy based novel binders for re-structured buffalo meat and mutton slices. He developed low fat meat products, tandoor tikka style chicken products, touch plate for assessing of bacteriological hygiene of different livestock carcasses. He worked on use of different natural preservatives to enhance the shelf life of meat and meat products, etc. He published more than 60 research papers in various National and International Journals. He attended various national and international conferences and presented more than 50 research abstracts and secured more than 15 best presentation awards. He is the principal investigator of various research projects and grants funded by SERB (DST), State plan, Contract Research, etc.



Dr. Prabhat Kumar Mandal was born in 1967 in West Bengal. He is recipient of **National Scholarship** during School and College studies. He got BVSc&AH from Bidhan Chandra Krishi Viswavidyalaya, WB, in 1991 and did his MVSc & Ph.D. majoring in Livestock Products Technology from Indian Veterinary Research Institute, Izatnagar in the year 1993 and 1996, respectively. He has worked as an scientist for 5 months in ICAR. He joined as an Assistant Professor in Dept. of Livestock Products Technology in September 1996, in Rajiv Gandhi Institute of Veterinary Education & Research (Pondicherry University). He was promoted as an Associate Professor in March, 2005 and **Professor** from January, 2012.

Dr. Mandal is teaching several UG and PG courses related to Livestock Products Technology for 25 years and engaged in research on Meat Science and Technology since last 25 years. Presently he is working on development of functional meat foods with natural preservatives and functional additives. He has worked as a **Visiting Professor** in Hankyong National University, South Korea and Konkuk University, Seoul from March, 2008 to February, 2010. Presently Dr. Mandal is **Editor-in-Chief** of *International Journal of Meat Science*, *Journal of Meat Science* and *Journal of Food & Nutrition Research* (International). He has edited advance reference books "Animal Products Technology" "Meat Quality Analysis" and author/co-author of text books on "Poultry, Egg and Fish Processing Technology" and "Practical Meat Science" for PG level and text book "Abattoir, By-products and Wool" and "Handbook of Meat Science" for U.G. Veterinary students.

Dr. Mandal is a **Fellow** of Indian Poultry Science Association, Indian Meat Science Association and International Society for Research & Development. He is enlisted in "**Marques Who's Who**" in the World 33rd Edition, 2016, and **Top 100 Educators**, 2016 by International Biographical Centre, Cambridge. Received **DSc (hc)** from IASR (2020) and **Lifetime Achievement Award** from VDGGOOD (2020). He has about 200 publications including 57 research papers, 12 books, related to Meat Science, Food Science, Poultry Science, Animal Science and Biotechnology in National and International Publishers/Journals of repute.



Dr. Ashim Kumar Biswas was born in 1978 in West Bengal. He obtained his BVSc & AH degree (equivalent to DVM) from West Bengal University of Animal & Fishery Sciences, Kolkata in 2000, MVSc & Ph.D. in Livestock Products Technology from the Indian Veterinary Research Institute, Izatnagar in 2002 and 2005, respectively. He has worked as an Assistant Professor at SKUAST-Jammu, 2005-2007, thereafter, GADVASU, Ludhiana in 2007 - 2012. He has worked as an Senior Scientist in Post-Harvest Technology Division at ICAR-Central Avian Research Institute, Izatnagar in 2012 - 2018 and Principal Scientist from 2018 - 2019. Presently he is working as a Principal Scientist in Indian Veterinary Research Institute.

Dr. Biswas has made original contributions on detection of some important pathogens using biochemical and molecular techniques and also determined many important pesticide and antibiotic residues in meat from Indian buffalo meat packing plant. He has developed many novel ready-to-eat meat products, and designed a number of low cost need based processing techniques including hurdle technology for meat and poultry products. Some of these technologies have been adopted and now under use by the many small scale processors/farmers. He teaches several LPT courses at the University and guides many undergraduate and post-graduate students since 2007. He has handled several research projects and grants funded by MoFPI, DST, RKVY (Govt. of India), ICAR, etc. in the capacity of PI and Co-PI.

Dr. Biswas has in his credit about 90 research publications in the journals of repute. He is author and co-author of five text books and three reference books. He has been recipient of several prestigious awards and honours, such as **DST young scientist award**, **Associateship award** of the National Academy of Agricultural Sciences (NAAS), Indian Poultry Science Association **Young Scientist Award**, **Fellowship** of the Indian Poultry Science Association, and several oral and best poster awards. He has served in a number of prestigious committees and boards including technical committee (Meat and meat products) of Food Safety Standard Authority of India, technical evaluation committee of Defense Food Supply (Meat and poultry).

Preface

Indian poultry industry was largely a backyard venture before 1960s, thereafter transformed into a vibrant agribusiness, presently with an annual turnover of more than Rs 1 lac crores. In the last four decades, the industry has grown from a subsistence activity into an organized, scientifically oriented and technologically driven industry. Among livestock sector, poultry industry contributes for about 1 per cent of the national GDP and about 14% of the Livestock GDP. The Indian poultry sector has witnessed one of the fastest annual growth of about 6% in eggs, 10 % in meat production and 8.35% in broiler production over the last decade amongst all animal based sectors. Today, broiler meat makes 50% of the total meat produced in India and poultry meat and eggs are the major sources of animal protein in India. Its share in total meat consumption is 28 per cent, as against 14 per cent ten years ago. As per Agriculture and Processed Food Products Export Development Authority (APEDA), India has exported 350,817.79 MT of poultry products for the worth of INR 57,458.34 lacs during 2019-20.

Poultry and poultry meat products constitute most important foods in our diets. Now-a-days with the advances in production, processing and preservation techniques for fresh poultry and processed products, quality maintenance and consumer preferences for poultry and poultry products are having paramount importance. Information on the advances in science and technology of poultry products processing is essential to the academia, government and industry personnel. However, very few good professional reference books on advances in poultry processing of Indian origin are available. The area of poultry processing technology is not as fully covered as other foods from the point of view of books dealing with important aspects like processing, preservation, quality and safety aspects. It must be pointed out that the poultry processing industry has incorporated important technological developments in recent years. The main goal of this book is to provide the reader with recent developments in new technologies for the full processing chain. In addition, no standard text books are there for covering the courses of Poultry and Fish Products Technology at Masters level and Advances in Poultry Products Technology at Doctoral level which was approved for uniform implementation by Indian Council of Agricultural Research (ICAR), New Delhi. Hence, we felt that a book covering advances in poultry processing, preservation, quality and safety aspects is essential for both students, academician, industry and government personnel.

In this text book, the topics are presented systemically with latest scientific advances and easily understandable by readers. Care and attention were paramount to ensure technical accuracy for each topic. The book contains 22 chapters covering wide areas of poultry processing and food safety includes the status of poultry and egg industry, health benefits of poultry meat consumption, nutritional manipulations for production of health promoting poultry products, application of biotechnology in both poultry production and poultry meat processing, advances in both primary, further processing and packaging of poultry and poultry products, development of functional poultry products, quality assurance of poultry and poultry products, utilization of poultry by products, poultry industry waste management, drug residues in poultry meat, GMP, HACCP and SPS measures applicable to poultry processing and standards and regulations of poultry processing. It is our sincere belief that this reference book will serve as an essential reference on advances in poultry processing and food safety. We hope this book to be very much useful to the PG students, researchers, academia, government and industry personnel.

Authors

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Chapter 1

Present Status of Indian Poultry and Egg Industry

INTRODUCTION

Indian poultry industry was largely a backyard venture before the 1960s, has transformed into a vibrant agribusiness, presently with an annual turnover of Rs 30 000 crores. Today, India is the third largest egg producer in the world (after China and US) and the fourth largest broiler producer. Undoubtedly, this impressive growth is a result of several factors, such as active developmental support from the state and central government, research and development support from research institutes, international collaboration and private sector participation. Presently Indian poultry industry is self-sufficient, supported by broad and strong genetic base with the productivity levels of broilers and layers comparable to those of western countries (US, EU). Today, however, globalization is posing greater challenges: namely, making the industry globally competitive and viable; and fulfilling the quite enormous potential for growth that is presented by changing food habits and preferences. The relative share of poultry sector in the national economy has remained below 1 per cent, but its share in the livestock sector is continuously rising. The share of poultry in total livestock production has risen from 10 per cent in 1996-1997 to 12 per cent in 2014-2015.

Importance of poultry meat over other meats

Poultry is, today, the major source of meat in India. Its share in total meat consumption is 28 per cent, as against 14 per cent ten years ago. It has outpaced its two competitors-beef and veal, and buffalo meat. High mutton prices, religious restrictions on beef and pork, and the limited availability of fish outside coastal regions have helped to make poultry meat the most preferred and most consumed meat in India. Expanding domestic production and increasing integration have pushed poultry meat prices downward & stimulated its consumption.