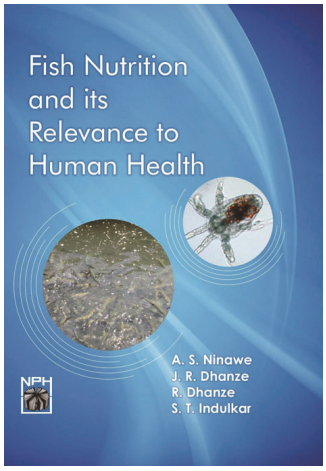

Fish Nutrition and its Relevance to Human Health. A. S. Ninawe, J. R. Dhanze, R. Dhanze and S. T. Indulkar. Narendra Publishing House, C-21, Varun Apartments, Sector 9, Rohini, Delhi 110 085. 2020. 402 pages. Price: Rs 4295.

Fisheries sector has a crucial role in nutrition and global food security, as it represents a valuable source of nutrients and micronutrients of fundamental importance for diversified and healthy diets. Public awareness of these health benefits has been growing in recent years, amid a broader trend of increasing health consciousness among consumers, particularly in middle-income group of the community. In less developed countries, the importance of fish as a food group is enhanced by the fact that fish contains many of the vitamins and minerals required to address some of the most severe and widespread nutritional deficiencies. In poor families that depend heavily on a narrow range of calorie-dense staple foods, fish can represent a much-needed means of nutritional diversification that is relatively cheap and locally available. While average per capita fish consumption may be low, even small quantities of fish can provide essential amino acids, fats and micronutrients, such as iron, iodine, vitamin D and calcium, which are often lacking in vegetable-based diets. It is well known that fish is a good source of animal proteins and has been the sole diet for many inland nations. Even today the fish offers 35–60% animal protein requirement of many Asian countries. Fish on an average contains 10–22% protein, 1–20% fat and 0.5–5% minerals and small amounts of carbohydrates. When the importance of fish as a source of protein is realized, there has been a tendency to increase the fish production used for direct human consumption rather than for other purposes. While increasing the fish production at the farm level one has to look for the quality of the fish and in order to rise the quality, nutrition becomes a vital topic for the fisheries sector. From this angle, the book under review is an excellent attempt to generate comprehensive information on the various aspects of nutritional requirements during various stages of fish culture operations. The editors and contributors of this book have also made sincere efforts to cover other topics related to fish nutrition like immunomodulation, role of digestive enzymes and nutraceuticals, probiotics including nutrigenomics and post-harvest and value addition. Another important area that has been part of the book is on water quality management for safe husbandry practices using biofloc technology. The use of biofloc technology for sustainable aquaculture is gaining lot of importance in recent years. The book also addresses present status of aquaculture, location-specific package and practices of indigenous fish culture.

The book consists of 14 chapters. The first two chapters are on nutrients and nutritional requirements of cultivable finfishes. Though good amount work has been carried out on the nutritional requirements of several cultivable finfishes, there are many gaps in the knowledge on the quantitative requirements and physiological functions of different vitamins, minerals and fatty acids in most of the fishes. Due to demand of quality feed and unavailability of nutritionally balanced starter feeds, there is a limit for quality fish production in the aquaculture industry. In this particular chapter, the authors have made concerted efforts to develop the database on all these aspects which would be helpful in preparing nutritionally balanced quality protein feeds for boosting the aquaculture production of cultivable fish species. Chapter 3 deals with food and feeding of larval stages and adults of important cultivable brackishwater and marine fishes. This chapter highlights the importance of micronutrients and macronutrients and their physiological role in releasing the energy and its utilization for growth and metabolism. Any imbalance in the micro- and macronutrients in the feed may lead to several disorders in the life cycle of fish. Unless the dietary supply and balance of nutrients can compensate for these changes, gross and clinical signs of nutritional deficiency develop and health of fish deteriorates.

Chapter 4 emphasizes the culture of diversified indigenous fish species which has high market value and good potential for enhancing aquaculture production using such selected species. One of the commercially important fish groups of this variety with high culture potential is the air breathing fish group. The chapter 5 is on next generation fish feeds for sustainable aquaculture which is also important in the sense that here the authors have highlighted the use of fish feeds to obtain precise functional aspects of the fish. This is called 4th generation of aquaculture where fish is reared with customized feeds with use of demand feeders, automatic feeders, medicated feeds and feeds developed for special purposes such as for early or repeated maturation in the same fish species. Chapter 6 illustrates the fish larval nutrition and the role of digestive enzymes. The author emphasizes that understanding the role digestive enzymes in early life stages of the fish will help us in designing proper and complete food for adequate growth of the fish larvae in culture system. Not much work has been done on nutrigenomics in the fisheries sector. Insufficient or excessive intake of dietary micronutrients produce profound damages to the organs and tissues, whose precise mechanism of action was not known till the advent of nutrigenomics. One of the major challenges is to identify the genes affected by change in nutritional status. All these aspects of the nutrigenomics are covered in chapter 7.

Chapters 8 and 10 deal with the role of nutraceuticals in fish feed to prevent diseases and promote good growth in the fish while doing captive culture. However, the authors rightly mention that not much work has been done in this subject area. Therefore, the nutraceuticals in fisheries sector need to be explored for the production of low cost feed for sustainable global aquaculture and boost production. Fish and processing by-products can be a driving force for both research and commercialization of nutraceuticals in future. Chapter 9 describes application of probiotics and prebiotics in aquaculture farming not only for controlling the diseases and improving the immunity but also for augmenting the growth in the fish and maintaining the water quality.

It is well known that use of probiotics help in building healthy gut microbiome community in the fish which is beneficial to the aqua culturist for raising good quality of fish yield within reduced period of culture operation than the normal. There is need to understand the underlying mechanisms in which probionts are able to colonize the gut and alter the gut environment to influence digestion, nutrient absorption, growth performance and immunity. Unfortunately, there is no much research on probiotics and their mode of action in building good microbiome environment in the fish gut system. Therefore, inclusion of probiotics in aquaculture, in general, requires further research to clearly understand the functional mechanism by which the microorganisms exert beneficial effects to the hosts. Unfortunately majority of the probiotic products available in Indian market are imported and hence, these products may not provide the anticipated benefit as they are intended to. To counter this, companies should come up with more and more probiotic products prepared from indigenously isolated bacterial strains.

Chapter 11 describes the biofloc technology and its application for sustainable aquaculture. It is an innovative and cost-effective technology in which toxic materials to the fish and shellfish such as nitrate, nitrite, and ammonia can be converted to useful product, i.e. proteinaceous feed. It is the technology used in aquaculture system with limited or zero water exchange under high stocking density, strong aeration and biota formed by biofloc. The culture of biofloc will be productive in the case of culture tanks exposed to sun. In India the biofloc technology still is in infant stage. A lot more research is needed to optimize the system.

Chapter 12 covers the detailed information on rainbow trout culture which is important for promoting aquaculture in temperate regions of the country. The expansion and intensification of rainbow trout farming, like most farmed fish, primarily depends on nutrition and feeding strategies and continuous research is needed to address new challenges in terms of strong competition for feed and nutrient resources.

Chapter 13 addresses very important aspect of the development of live fish food organisms. The provision of high-quality and suitable live feed is crucial for the success of the growth and survival of fish larvae in the initial phases of nursery. At present, a number of live food organisms are cultured at farm levels but due to heavy demand for the expansion of aquaculture activities there is a scarcity of the same. However, the wild collected live feeds are forming a way to entry of pathogenic organisms, which can cause diseases to the cultivable organisms. Furthermore, collection of live feeds from wild is a time-consuming processes and the availability of necessary species in required numbers is also never sure. Therefore, there is a need to explore the possibilities of mass culture of different live food organisms and also standardize the technology. The last chapter deals with preparation of different indigenous fermented fish products and their utilization as routine requirement of the local needs of the people of northeast India. These products are rich in amino acids, nitrogen and various trace elements, including sodium chloride, phosphorous, calcium and fluoride. These products undoubtedly contributed to the survival and good health of entire generations who had only a small quantity of rice and vegetables to eat. Such ethnic fish products are mostly consumed as main dish rather than condiments. Flavour of such fermented fish products is of great importance. It is mentioned that such fermented fish products will have lot demand from nearby South East Asian countries in the near future.

In conclusion, the book covers most of the nutritional aspects of the fisheries sector which will be useful and beneficial to the fish farmers while developing nutritional strategies during planning of scientific aquaculture farming. However, I feel that the fish nutritional relevance to human health system is not covered much. My compliments to all the contributors of this book for taking sincere efforts for writing chapters by collecting comprehensive information on the various aspects of fish nutrition.

I congratulate the editors A. S. Ninawe, J. R. Dhanze, R. Dhanze and Sudhakar Indulkar for taking initiative in selecting the appropriate topic of the book and also identifying the resource persons for writing the various aspects of fish nutrition. I am optimistic that the book will serve as a basic document for the stakeholders, including policy planers, researchers, managers, students and farmers in enhancing the fish production through developing knowledge of fish nutrition and related aspects of aquaculture.

A. D. DIWAN

Indian Council of Agricultural Research, New Delhi 110 001, India
e-mail: arvinddiwan@yahoo.com