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Indian pompano- An emerging mariculture species for addressing nutritional security and fishpreneurship

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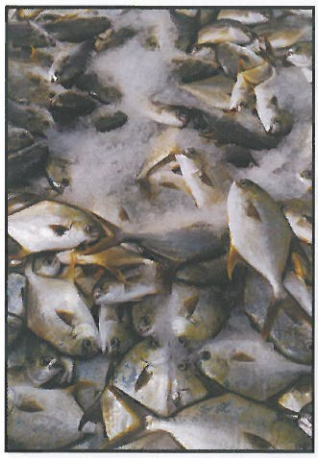
In the backdrop of depleting marine resources in India, mariculture has great prospects for increasing the seafood production to meet the fish protein requirement of the country. Species diversification is one of the effective approaches to achieve sustainable fish production. Pompanos belonging to the Genus Trachinotus of Carangidae family are considered as a delicacy worldwide and farming of pompanos has successfully been practiced in many countries in the Asia-Pacific region. Indian pompano (*Trachinotus mookalee*) is a highly desired emerging mariculture species in India with high commercial value both in domestic and international markets. The seed production technology and grow out rearing of Indian pompano is successfully standardized by Visakhapatnam Research Centre of ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI). The fillets prepared from Indian pompano are whitish and boneless with a firm texture, making it suitable for a good table fish.



Harvested Pompano

Pompano products

Comparison of nutritional composition of farmed pompano and wild pompano

It is necessary to evaluate and compare the nutritional qualities of a newly introduced mariculture species to its natural counterparts. Nutritional composition of a fish species is decided by multiple factors including life stage and age, feed, season, locality etc. Studies conducted at ICAR-Central Institute of Fisheries Technology (ICAR-CIFT) revealed that nutritional quality of farmed pompano reared under different

aquaculture systems is superior to that of wild caught pompano.

Protein, water, fat and ash represents the proximate composition, accounting for 98% of edible portions of fish. Proximate composition of wild and farmed Indian pompano is given in Table 1. The major nutritional component, protein content of Indian pompano is 17-19%, indicating that it is a rich source of protein. Protein content of wild pompano was slightly lower to that of farmed pompano. The nutritional benefits of fish are greatly influenced by its fatty acid composition. Fat content was higher in pond reared fishes followed by cage reared fishes while the wild caught fish had the lowest fat content. Apart from this, the proportion of Long Chain Polyunsaturated Fatty Acids (LC PUFAs) having well known health benefits was higher in farm reared pompano compared to its wild counterpart. In this point of view, farming of Indian pompano attracts more significance compared to fresh water fishes which have negligible amounts of long chain PUFAs. Water has a technological role during processing of fish as water decides the texture of fish products.

The comparison of nutritional quality indicated that farmed Indian pompano provides adequate quantities of good quality protein and beneficial fats and helps in meeting the nutritional security needs of the country.

Table 1. Proximate composition of farmed and wild Indian pompano

Parameter	Wild pompano	Sea cage reared pompano	Pond reared pompano
Protein (%)	17.14	18.73	18.16
Fat (%)	1.89	2.13	4.99
Moisture (%)	80.12	76.85	76.24
Ash (%)	1.42	1.91	1.32

Processing yield and mince quality

Pompano is a white fleshed fish that makes it amenable for making value added products of high consumer acceptability fetching good prices in the retail markets. Average yield of various styles of pompano fish is given in Table 2.

Physicochemical property of fish mince is an important parameter deciding the technological requirement for processing. Water holding capacity of fish mince is one of the most technologically important attributes deciding the quality of mince based products like surimi and other value added coated fish products. Cooking loss during processing is also influenced by water holding capacity. Mince from cultured pompano displayed higher water holding capacity than wild pompano. Since the water holding capacity of wild pompano mince was poor, it showed higher cooking loss compared to cultured fishes. In addition, because of the lower fat content, hardness and chewiness of wild pompano was higher compared to farmed pompano.

Table 2. Processing yield of Indian pompano

Product	Yield
Beheaded and gutted pompano	65-70%
Steaks	60-65%
Fillet	45-50%
Mince	40-45%

Marketing and future prospects

The colour of flesh, taste of meat, nutritional composition and accrued health benefits are the positive drivers for consumer acceptability of any fish species. Marine fish are generally preferred for their richness in health beneficial omega 3 fatty acids. However, marine catches are seasonal and depleting every year. Farming of high valued marine fish is a viable option to meet the consumer demand while reducing pressure on wild stock. Indian pompano has all the desirable attributes making it as one of the highly desired marine fish in India and potential market demand exists for farmed Indian pompano in the domestic market.

Domestic market prices are very lucrative for Indian pompano, fetching Rs. 300/kg. Marketable table size of Indian pompano is 600 g which may be reached within 8 months culture period in sea cages or brackishwater ponds. Presently, the farmed Indian pompano is marketed in few maritime states of India including Kerala, Tamilnadu, Karnataka and West Bengal.

Coastal aquaculture sector of India is centered majorly on Pacific white shrimp, *Penaeus vannamei*. Species diversification by introducing new candidate species like Indian pompano is essential for ensuring sustainable development of coastal aquaculture in India. Diversified aquaculture provides safeguards against disease epidemics and international trade

issues associated with single species aquaculture. Indian pompano is presently marketed in the internal markets but has potential for export either as whole fish or value added products. Product diversification in the form of ready-to-cook products such as fillets, steaks, marinated, battered and breaded products or ready-to-eat products such as fish curries help in further expansion of the farmed pompano market. Live marketing of cage farmed pompano coupled with on-site product preparation can open new vistas in coastal tourism.

Exploring the potential export of Indian pompano in Europe, US and Asian markets requires continuous supply of raw material. For this, the production capacity needs to be scaled up by widening the farming of Indian pompano across the coastal states of India, either through open sea cage culture or fish ponds. The consumer demand and marketability of the farmed Indian pompano opens livelihood and entrepreneurial opportunities for fishers, youth and prospective fishpreneurs.

Understanding the immune system of fish

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Introduction

Fish possess innate and adaptive immune defence systems. The innate parameters are at the forefront of immune defence and are crucial factors in disease resistance. The adaptive response of fish is commonly delayed but is essential for long-lasting immunity and is a key factor in successful vaccination. The massive increase in aquaculture in recent decades has put greater emphasis on studies of the fish immune system and defence against diseases commonly associated with intensive rearing of a few economically important species.

Such research has helped define the optimum conditions for maintaining immunocompetent fish in culture, for selection of fish stock (breeding), as well as developing and improving prophylactic measures such as vaccination, and use of probiotics and immunostimulation in the aqua-cultured species. However, there is great variation in disease susceptibility and immune defence between different fish species.

The immune response described in one species may not be the same in other species. Indeed, the immune system is largely unknown in most fish species, especially in newly aquacultured species, limiting the development of immune control strategies against infectious disease. This article will describe the main components of the innate and adaptive immune system of fish.

A. Immune cells and organs in fish

Fish live in an environment containing a great variety of infectious agents such as viruses, bacteria, fungi, protozoa and multicellular parasites and if they multiply unchecked can cause various diseases and even kill the fish. Thus fish have evolved effective immune responses that initially recognize the pathogens or other foreign molecules (antigens), triggering pathways that subsequently elicit effector mechanisms to attempt to eliminate them. The immune responses elicited fall into two main categories: innate (or non-specific) immune responses and adaptive (or specific) immune responses.

Immune responses are mediated by a variety of cells and secreted soluble mediators. Leucocytes are central to all immune responses, and include lymphocytes (T cells, B cells, large granular lymphocytes), phagocytes (mononuclear phagocytes, neutrophils and eosinophils) and auxiliary cells (basophils, mast cells, platelets). Other cells in tissues also participate in the immune responses by signalling to the leucocytes and responding to the soluble mediators (cytokines) released by T cells and macrophages.

The cells involved in the immune responses are organized into tissues and organs in order to perform their functions most effectively. These structures are collectively referred to as the lymphoid system, and are arranged into either discretely encapsulated organs or