

Consternations on the Safety of Commercial Aquaculture Probiotics in India

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Due to intensification of aquaculture, aquatic species are exposed to high-stress situations, increasing the incidence of diseases resulting in reduction of productivity. The need for improved disease resistance, growth promotion, enhanced nutrient digestion, better water quality and stress tolerance has resulted in the use of probiotics in aquaculture. Probiotics are regarded as live microbial feed supplement, which beneficially affects the host by improving microbial balance of its environment, intestine or both. Research on aquaculture probiotics worldwide has projected it to be a safe and efficient prophylactic health measure for attaining sustainable intensification in aquaculture. The wide popularity gained by aquaculture probiotics has broadened their market. There is an increasing trend in the use of commercial probiotics in shrimp aquaculture. Currently, commercial aquaculture probiotic products claim to contain various microbes such as bacteria under the genera *Bacillus* sp. and *Pseudomonas* sp., lactic acid bacteria like *Lactobacillus* sp., *Pediococcus* sp. and *Bifidobacterium* sp., autotrophs such as *Thiobacillus* sp., nitrifying and denitrifying bacteria, fungus *Aspergillus* sp., the yeast *Saccharomyces cerevisiae* and many more. Farmers are increasingly dependent on a proliferating range of commercial probiotics, often of uncertain composition, efficacy and safety. The market of aquaculture probiotics used for shrimp farming in India is estimated to be more than \$100 million. Even though the aquaculture probiotics are highly commercialized and widely used, lack of regulations to access the quality of aquaculture probiotics is absent in most of the countries.

In India, the only government regulation that exists for probiotic is the certificate of standards for antibiotic free aquaculture inputs issued by Coastal Aquaculture Authority (CAA). The aquaculture input manufacturers or distributors register their products by applying directly to CAA with the antibiotic test result statement obtained by them. Randomized sampling of aquaculture inputs from different market locations for monitoring its quality and content is currently lacking. Although many of the feed supplements declared to have live microorganisms, were registered as either probiotic, feed additive or immunostimulant. As such there are no criteria for assigning the aquaculture inputs into a specific product category at the time of registration.

In the present study, sixty commercial aquaculture probiotics; 53 indigenous, 5 imported from USA and 2 imported from Thailand, procured from markets of the state of Andhra Pradesh were analysed for the presence of antibiotics. Five products included in our study does not have CAA registration and were still available in the market. An initial screening by microbiological three plate method with *Bacillus subtilis* revealed the presence of antimicrobial substance in two of the probiotics. Both the products were from the same manufacturer and shall contain *Lactobacillus* and yeast based on the label. Microbiological analysis revealed that *Lactobacillus* was not present in both the probiotics. Both the products were analysed for the presence of antibiotics using LC-MS/MS (SciexQTrap) in ESI+ mode. Multiple Reaction Monitoring technique was used to identify and quantify the antibiotics. The ground sample was extracted with acidified acetonitrile and buffered water (50:50), following

C18 dispersive cleanup and injected into LC-MS/MS for analysis. Quantifier ion of the compound and qualifier/quantifier ion ratio was used for further confirmation of identity. Both probiotics were observed to contain multiple antibiotics; trimethoprim, sulfamethoxazole and ciprofloxacin and an antiparasitic drug albendazole. Since the aquaculture probiotics are directly applied to farms and further get released to aquatic environment including natural water bodies, presence of any hazardous material including antibiotic is a matter of concern. A candidate probiotic proposed for commercialization should assure high level of protection to human and animal and should be regarded as GRAS. Economic burden spared

by small holder aquaculture farmers for the commercial probiotics with the perception of better productivity will be justified only if they have a significant positive effect in practice. The actual quality and safety of the commercial aquaculture probiotics sold are under question. Most of the brands do not fulfil the basic requirement of labelling the exact contents of the probiotic product. Moreover presence of antimicrobial substances is an added concern to the farmers, seafood processors and consumers. Therefore, development and implementation of standardized assessment procedures and strict regulations over labelling, content, safety and health statements of commercial aquaculture probiotics are urgently required.

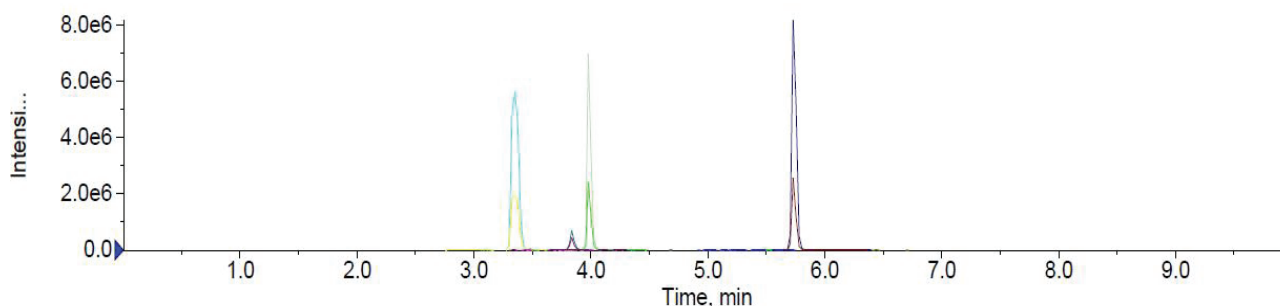


Fig: LC-MS/MS chromatogram showing antibiotic residues in commercial aquaculture probiotic



Development of Protein concentrate from *Squilla* by foam mat drying

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Foam mat drying is a recent technique adopted by the food industry for drying high moisture foods like fruit juice or vegetables. It involves the formation of stable foam by adding a whipping agent into liquid or semi liquid foods and subsequent whipping. The foam facilitates rapid drying and retention of nutritional quality of

heat sensitive food materials. *Squilla* is a major component of shrimp by-catch and utilization of *Squilla* sp. is limited to the preparation of squilla meal, silage and manure apart from chitosan production. *Squilla* spp. contains 13-15% protein, however, higher moisture content and hygroscopic characteristic of its protein confines