INTRODUCTION
1. INTRODUCTION

Aquaculture is steadily expanding both in terms of total world production and the diversity of cultured species (Tacon and Meitan, 2013). In the last three decades world food fish production of aquaculture has expanded by almost 12 times, at an average annual growth rate of 8.6 percent. World aquaculture production attained an all-time high in 2012, at 67 million tons (excluding aquatic plants and non-food products) with an estimated total value of US$138 billion (FAO, 2014).

Asian seabass (*Lates calcarifer*) also known as barramundi is euryhaline in nature and it can tolerate wide range of salinity. It is primarily a carnivorous fin fish widely distributed in the tropical and subtropical regions of the west pacific and Indian Ocean coast (Newton *et al.*, 2010). Seabass is being recognized as an alternate candidate species for commercial aquaculture in India due to its high market demand and excellent growth potential for grow-out culture (Ravisankar and Thirunavukkarasu, 2010). The fish is mostly cultured in cages, either in natural water courses or artificial ponds and reservoirs (Glencross, 2006). In the early life stages (2-3.5 kg of body weight) majority of seabass are males but when they attain the body weight of 4kg and above, majority becomes females. Worldwide total aquaculture production of seabass has increased from 28,698 tons in 2003 to 75,405 tons in 2012 (FAO, 2014).

In large scale production of aquaculture including seabass, the aquatic animals are exposed to stressful conditions, susceptibility to diseases and often leading to mortalities resulting in serious economic losses. Bacterial and viral infections often affect cultured aquatic organisms, whose immune system may be compromised by stressful conditions. Current methods for prevention and treatment
of infectious aquatic diseases include vaccines, antibiotics and chemotherapeutics. However, antibiotics usage have been extensively criticized for potential development of antibiotic-resistant bacteria and destruction of environmental microbial flora, as well as having relatively high cost and marginal effects in some cases. Certain antibiotics have been shown to suppress the immune system potentially making aquaculture organisms more susceptible to viral or parasitic infections. Increasing concerns of antibiotics use have resulted in a ban on sub therapeutic antibiotics use in Europe and stringent regulations in application of antibiotics in the United States and other countries. These policy alterations may impact aquaculture and have therefore prompted interest in developing alternative strategy to disease control (Jitender et al., 2011). In addition the ever increasing input costs coupled with decreased feed utilization resulted in decreased profit margins in the aquaculture enterprise. This scenario necessitated the researchers to look for an alternative to overcome the diseases problem and to improve the feed utilization through suitable additives.

As an alternative strategy to antibiotics, prebiotics have recently attracted extensive attention in aquaculture (Manning and Gibson, 2004). Prebiotics are non-digestible food ingredients that beneficially affect the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon (Ringo et al., 2010). Manipulation of microbial population in the intestinal tract of aquatic animals through the use of prebiotics is the novel approach to improve the health of the aquatic animal (Akrami et al., 2013). The intestinal microbiota plays an important role in the nutrition and health of the host organism. Gastro intestinal tract (GI) has been considered as potential entry route for pathogenic bacteria and the intestine possesses high bacterial load. Potential pathogenic bacteria are part of the intestinal microbiota of every healthy organism (Gatesoupe, 1999) and if the
conditions within the intestine become favorable (i.e. the host becomes stressed or is subjected to poor nutrition etc) then there is a potential for pathogenic organisms proliferation, translocation and ultimately infection of the host organism.

Prebiotics are dietary carbohydrates that escape digestion in the upper GI tract but alter the bacterial composition of the lower gut by changing the type of substrate provided to the existing gut microbiota (Mei et al., 2011). Prebiotics unlike probiotics are not organisms. They have less influence in natural environment. Prebiotics have received considerable attention in terrestrial animals as a way to improve disease resistance as well as to increase growth performance of the host organism. However, the utility of prebiotics in aquaculture has not been explored completely. Compounds which have been shown to have prebiotic characteristics include fructooligosaccharides (FOS), mannanoligosaccharides (MOS), galactooligosaccharides (GOS), xylooligo-saccharides (XOS), arabinoxylooligosaccharides (AXOS), isomaltooligosaccharides (IMO), inulin and GroBioiTC-A. Although these are mostly plant derived additives and are often not naturally present in fish diets, especially in carnivorous fish, the prebiotic potential of oligosaccharides and other dietary fibers may have interesting applications in aquaculture to stimulate gut health and the presence of beneficial gut bacteria will aid in suppressing the potentially deleterious bacteria (Hoffmann 2012).

Additionally to explore the possibility of feed ingredient containing prebiotics and its effects on seabass was studied using the natural ingredient Jerusalem Artichoke (JA). The main sources of inulin are JA and chicory root. JA is also a good source of minerals and vitamins (Kays and Nottingham, 2007). Inulin from JA is a non-starch carbohydrate known as a fructan which is considered as a functional ingredient with similar characteristics to dietary fiber. Because of its
nutritional properties inulin from JA has been used as a prebiotic (Rubel et al., 2014).

Available studies have indicated that prebiotics can improve health, growth performance and feed utilization of various fish species (Soleimani et al., 2012; Akrami et al., 2013; Ortiz et al., 2013; Cerezuela et al., 2013; Zhang et al., 2014; Safari et al., 2014; Talpur et al., 2014), enhance their non-specific immune responses and resistance to bacterial infections. The utility of prebiotics in the diet of Asian seabass has not been explored so far. With this background an attempt was made to study the effect of supplementation of prebiotics on health and growth of Asian seabass, *L. calcarifer*. 