CHAPTER 1

INTRODUCTION
The food, providing nutrients for human consumption and generally derived from plant or animal sources, is preserved by various means that intended for maintaining the desirable qualities. Improper preservation, may affect the food in many ways such as loss of functional properties, colour, flavour, aroma, texture, appearance or nutrients due to oxidation, hydrolysis or any other chemical reactions. Modifications in preparation and preservation of food commodities have been introduced to improve acceptability, palatability and nutritive value.

Throughout history, the problem of food spoilage has plagued man. Early attempts to preserve food focused on the most readily available substances or processes, such as using sugars, salts, spices and wood smoke. An advanced and more technical application of preservative and preservation processes in today’s food supply has allowed for several new and innovative methods for longer shelf life of food to be introduced. Today, however, preservation has utilized factors such as temperature, antibiotics, irradiation, packaging and also various combinations of these factors.

The application of freezing for food preservation dates back to prehistoric time. Freezing has become one of the common methods of food preservation, both as a means of preserving food for sale to the ultimate consumer and for the preservation of foods in the home. Furthermore, freezing appears to replace canning and curing to a considerable extent. Perhaps, freezing is an excellent method of preservation of food has wide applications, based on the retardation of microbial growth to a point at which decomposition due to microbial action does not occur (Peterson and Gunnerson, 1974). Additionally, low temperature delays many temperature dependent chemical reactions and inhibit both endogenous and microbial enzymes (Jay, 1994).
Freezing and frozen storage are important methods for the preservation of fish and fishery products. It is also considered as one of the best methods to preserve the meat in its native state for a long time without much spoilage. At present freezing is confined mainly to shrimps, frog legs, cuttlefish and lobsters meant for export.

The lipid oxidation is the primary cause of deterioration in the quality of meat and meat products during storage which is leading to rancidity and the development of off flavours and undesirable odours, loss of colour and texture and decrease in nutritive value (Buckley et al., 1995). Thus, lipid oxidation of food is partially responsible for many problems which shortens the shelf life of food products. The effect of rancidity can be minimized to some extent by cold storage. Likewise, food poisoning is a result of the toxins produced by microorganisms before the food is frozen. Refrigeration is often the main and frequently the only factor to control food borne pathogens.

There are also instances when microorganisms, some of which are most potent food poisoners, are found growing at freezing temperatures. *Staphylococcus aureus*, *Listeria monocytogenes*, *Aeromonas hydrophilus*, *Salmonella* spp., *Pseudomonas* spp. etc. are the major psychrotrophic pathogens, which can survive at low temperature. Consequently, temperature abuse of refrigerated ready-to-eat foods could result in food borne illness. Thus, to overcome these problems, there is a need for a preservation system to provide food that has microbiological and chemical stability. Currently, a range of substances that possesses antimicrobial property has been investigated to retard the growth of psychrotrophs in food materials.

However, addition of antimicrobial ingredients in combination with refrigeration may inhibit spoilage and provides an additional protection to food samples.
Generally, consumers are suspicious of choosing food treated with additives and prefer additive free foods. Several synthetic chemicals having antimicrobial property demands prudence in handling, since they are corrosive and toxic to the consumers. Consequently, alternative preservatives are needed which possess antimicrobial activity but cause no health problems to the handler and consumer. In this respect, various naturally occurring plant products of herbs and spices, classified as generally recognized as safe (GRAS) are used as inhibitors towards the growth of microorganisms. Often, the antimicrobial compound of herbs is found in the essential oil fraction. In addition to imparting flavour and aroma and possibly aiding in the control of microbes, certain spices help to prevent the development of rancidity. These food flavourants, thus improves the food shelf stability and safety even at moderate levels.

Although antimicrobial activity of spices and essential oils represents a promising research area, most of such studies were confined to in vitro study using of plant extracts. But little information exists regarding the practical use of such antimicrobial extracts in foods. Certain commonly used herbs or spices for culinary preparations are selected for determining the antimicrobial property on meat samples.

The consumption of frozen food items has undergone considerable increase in recent years and interest has thus grown concerning its quality and shelf life. With the increase in the use of refrigeration appliances in domestic purposes, there is an urgent need to provide information in detail about the storage life of different food products in refrigerators. Even though the lipid peroxidation and peroxidase enzyme have a major role, the data on this aspect is lacking in food samples during frozen storage.
Realising the importance of the problems related to food preservation, this thesis is designed for further, significant and extensive studies covering all its realms—biochemical, as well as microbiological aspects of food materials during frozen storage.

Aims and objectives of the study

This thesis reports the following studies:

1. Biochemical changes of selected frozen food items.
2. Lipid peroxidation and changes in the activities of the antioxidant enzymes of frozen meat samples.
3. Antimicrobial property of selected food additives on meat samples both at freezing and chilling temperatures.

So this thesis embodies the study on the effect of frozen storage on some food commodities such as marine fishes viz. pomfret (*Pampus argenteus*) and mackerel (*Rastrelliger kanagurta*), fresh water fishes viz. two species of ophiocephalus (*Channa punctatus* and *C. striatus*), molluscs (*Mytilus edulis* and *Sepia pharaonis*) and meat samples viz. buffalo meat (*Bubalis bubalis*), chicken (*Gallus domesticus*), chevon (*Capra hircus*) and pork (*Sus domesticus*). The aim of this work was to evaluate the biochemical alterations of food under refrigeration. Biochemical changes of frozen food items were evaluated by studying the following parameters such as proteins like salt soluble protein (SSP), water soluble protein (WSP), crude protein (CP) and drip protein content (DPC), lipid profile viz. total lipid (TL), free fatty acids (FFA), triglycerides (TG) and phospholipids (PL) and changes in moisture content (MC),
glycogen and lactate dehydrogenase (LDH). Lipid peroxidation of frozen meat samples were studied by determining the levels of thiobarbituric acid reactive substances (TBARS) and conjugated dienes (CD). The antioxidant status was investigated by the estimation of reduced glutathione (GSH) and by the assay of enzymes: catalase, superoxide dismutase (SOD), glutathione-S-transferase (GST), glutathione peroxidase (GSH-Px) and glutathione reductase (GR).

In addition to the above biochemical changes, the antimicrobial property of certain food additives on buffalo meat stored under both freezing and chilling temperatures was studied by total plate count (TPC) method. The food additives selected for this study are all spice (*Pimenta officinalis*), mint (*Mentha piperita*), coriander (*Coriandrum sativum*) and curry leaf (*Murraya koenigii*).