INTRODUCTION

The symbiosis of two most important microorganism *Lactobacillus bulgaricus* and *Streptococcus thermophilus* resulted in lactic acid fermentation to convert milk into a fermented product known as ‘yoghurt’. It is an exotic product but now very much accommodated as an Indian fermented milk product, because of its nutritional and therapeutic value like dahi (curd). The soft and palatable texture also is the reason for the popularity of the product. (David, 2008)

Fermentation is the microbially mediated conversion of sugars into products such as alcohol and lactic acid. When consumed by humans, fermented foods often introduce microflora that inhabit the human body. (Ross et al. 2002)

Fermented foods and beverages constitute a major portion of people’s diets in Africa (Oyewole, 1997). Lactic acid bacteria (LAB) are one of the microorganism that dominate fermented food (Guasch et al. 2005, Robert, 2008). Today, LAB is of essential importance for their role in most industries of enzymatic activities of LAB that lead to production of volatile substance, which contribute to flavour, aroma, and texture development (Kleerebezem et al. 2000). Certain LAB strain characterised by their ability to transform lactose and improves the digestibility of fermented dairy products (Weinberg et al. 2007) as well as their preservation. (Abdelbasset and Djamila, 2008).

Fermentation is an expedient to extend the shelf life of milk thereby, allowing storage and transport. In fact the generation of lactic acid and short-chain fatty acids from lactose and the consequent fall in pH inhibits the growth of many pathogenic organisms. This technology has been widely practised in eastern European countries and in central Asia for a long time reaching also some areas in Africa. Fermented milk has different denomination according to the region of production. The two most common fermented milk available in the Eastern Europe that contains probiotics are yoghurt and kefir. (Komai and Nanno, 1992).

Fermented milks are nutritionally similar to unfermented milk, except that some of the lactose is broken down to glucose and galactose. Galactose is rapidly absorbed by the intestinal system and is rapidly metabolized to glucose. This makes fermented milk an important food in cases of lactose intolerance. (Scrimshaw & Murray, 1988)
Fermented milks represent an excellent source of nutrients such as calcium, protein, phosphorus and riboflavin. Fermented milk products are indeed able to enhance the absorption of some minerals such as calcium and non-haem iron, as a result of their lower pH. The increased calcium absorption with fermented milk consumption is related to both a direct effect of the acidification of intestinal lumen and in the reduction of the mineral complex formation with other dietary components. (Fukushima et al. 1998)

A number of health benefits have traditionally been attributed to fermented milk products, and they have been used to prevent a wide range of diseases including atherosclerosis, allergies, gastrointestinal disorders and cancer. (Macfarlane & Cummings, 1999)

Yoghurt is a very good source of calcium, phosphorus, riboflavin-vitamin B2 and iodine. Yoghurt also emerged as a good source of vitamin B12, pantothenic acid-vitamin B5, zinc, potassium, protein and molybdenum. These 10 nutrients alone would make yoghurt a health-supportive food. They also manufacture vitamin B like- biotin, niacin (B3), pyridoxine (B6), and folic acid. (www.whfoods.com)

The nutritional and potentially therapeutic value of food is a key characteristic in the development of new value-added products manufactured for health conscious consumers (Garcia et al. 1998). Yoghurt is one of the most popular fermented milk products worldwide and has gained widespread consumer acceptance as a healthy food (Mckinley 2005). Frozen yoghurt has been the fastest growing product in the frozen dessert market in recent years (Opdahl and Baer, 1991, Guinard et al. 1994). Consumers interest in frozen yoghurt stems from the desirable nutritional properties attributed to the product (Davidson et al. 2000). Yoghurt contains substantial amounts of live lactic acid bacteria and the beneficial effects of yoghurt are postulated to be due to its probiotic contents (Ghosh and Rajorshia, 2003).

Yogurt is considered the most popular fermented milk and it is characterized by a soft, viscous, gel consistency and a delicate flavour. In many countries, yogurt is classified according to the fat content (whole, semi-skimmed or skimmed), but the most used classification refers to the physical structure of the gel, being set, stirred or fluid, set yoghurt should have a firm enough body to be spooned, texture should be fine and smooth, without clots or granules and no fissures and it should have a typical acid taste. Milk components and their concentrates are also important especially fat and non-fat solids. Shelf life of yoghurt should be around twenty days, under refrigeration and the product should maintain its own
characteristics during storage. Beyond that time, the number of starter culture bacteria may drop, acidity increases, syneresis often occurs, off-flavours are likely to appear and texture can change. (Code of federal regulation, 2007)

Yoghurt is a semi fluid fermented milk food having a smooth texture and mildly sour flavour because of its lactic acid content. Yoghurt may be made from the milk of cows, sheep, goats or buffalo. Cow’s milk is used in the United States and north central Europe; sheep and goat milk are preferred in Turkey and South Eastern Europe; milk from the buffalo is most commonly used in Egypt and India. (Britanica, 2009)

The solid content is an important determinant in the texture and quality of yoghurt. The level of fat and SNF required to be present in yoghurt is governed by the legal standard of the country concerned. In index a minimum SNF of 8.5% is prescribed. The requirement of fat content in yoghurt ranges from <0.5% to >3.0% depending upon the type of the product. Though these are the levels required, the physical properties of yoghurt, like viscosity and consistency of the coagulum are of great importance from the manufacturers point of view. In general, the higher the level of solids in the yoghurt mix, the greater will be the consistency of the end product. The relationship between the level of solids in the milk and the consistency of yoghurt has been well established. The best yoghurt is probably made from milk containing 15-16% total solids and composition of most commercial yoghurts falls within the range of 14-15% total solids. The increased protein content in the mix, results in custard like consistency following the desired fermentation. Fat content too has an important role in mouth feel and production of flavour compounds and prevention of wheying off in yoghurt. Lower solid levels lead to textural defects. To overcome this problem, stabilizers and emulsifiers are often used during the manufacture of yoghurt. The primary aim of adding stabilizer to the basic mix is to enhance and maintain the desirable characteristics of yoghurt, i.e. body and texture, consistency, appearance and mouth feel. Their use is governed by legislature regulation. In India, under the PFA, a list of compounds with permitted concentrations is drafted.

Fermented milk products are well known for “long life” and “cure all” properties due to their nutritional therapeutic and prophylactic values. The main advantage of regular intake of fermented milk product such as, yoghurt, dahi, acidophilus milk is: these products are easily absorbed and better assimilated than sweet whole milk. Assimilating of milk is 32 percent in one hour, while that of fermented milk products is 91 percent in the same period.
Better assimilation of fermented milk product is due to partial secretion by digestive tract glands. They stimulate appetite due to their pleasant refreshing and pungent taste and also improve central nervous and respiratory system. Curd consists of a sufficient amount of indispensable amino acid methionine, which removes excessive fat from the liver. In case of atherosclerosis, methionine improves the general condition of the patient is gastric juice secreted by the action of fermented milk product and the desirable ratio of calcium and phosphorus induced leads to a high digestive capability. Yoghurt is believed to promote good gum health, possibly because of the probiotic effect of lactic acid present in yoghurt. (Wikipedia, 2009)

The yoghurt bacteria stimulate the host’s immune system to resist infection by producing bactericidal or bacteriostatic agents such as organic acids (Welch, 1987). Yoghurt mixed culture caused pronounced inhibition of E.coli and S.aureus (Singh et al. 1982), Salmonella typhimurium, spoilage organism and food borne pathogens. Fermented milks have been used to improve intestinal health since ancient times. The most common use of yoghurt has been in treatment of gastrointestinal disorders such as diarrhoea and constipation, gastroenteritis, diarrhoea, skin infections and herpetic and aphthous stomatitis. Fermented products and lactic acid bacteria have potential anticarcinogenic activity. (Goldiin and Gorbach, 2003, 2007) Antimutagenic effects of yoghurt have been reported by Cenci, 2002. Hypcholesterolemic effects of yoghurt have been reported by Mann and Spoerry (1994). Dahi as a traditional fermented milk product is fairly similar to yoghurt, the value of fermented milks as therapeutic agents in the treatment of gastrointestinal disorder and other ailments was recognized in the ayurvedic system of medicine in India quite long, time ago. Yoghurt has a sharp characteristic acid flavour pleasant sensation on the palate. Whereas, dahi has a delicate bouquet of diacetyl besides other flavour components.

Growing national concern over nutrition and personal health is expressed by the general agreement that about one half of adults believe that weight control is a major diet and health concern. Increased per capita consumption of yoghurt, low fat, and skim milks increased 211, 139 and 2% while that of whole milk decreased 31%. These factors and the 19% increase of per capita sales of flavoured milks and drinks indicates an under exploited market opportunity. As a result of increased farm production efficiency and economic factors including milk price supports, farm milk production has been rising reaching an all time high of 58.37 million kg in 1980. (Ryan et al. 2004)
Ice cream is a frozen dessert usually made from dairy products, such as milk and cream, and often combined with fruits or other ingredients and flavours. Most varieties contain sugar, although some are made with other sweeteners. In some cases, artificial flavourings and colourings are used in addition to (or in replacement of) the natural ingredients. This mixture is stirred slowly while cooling to prevent large ice crystals from forming; the result is a smoothly textured ice cream.

Frozen yoghurt is a dessert similar to ice cream but made with yoghurt rather than cream. It tends to be healthier than ice cream so many people choose it as an alternative. It is important to realize, however, that frozen yoghurt, while is richer in many minerals and nutrients than ice cream.

Frozen yoghurt is perhaps best viewed health-wise a being somewhere between real yoghurt and ice cream while it contains protein, the protein found in frozen yoghurt is often as little as a third the amount found in regular yoghurt and roughly equivalent to that found in ice cream. While ice cream is quite high in fat between 10 & 18% fat by weight-frozen yoghurt varies more widely. It usually has been fat than a comparable ice cream, but higher amount of fat and substantially more calories than comparable yoghurt. Fat free frozen yoghurt exists, but they often have even more added sugar than other varieties. (Tsang, 2009)

Riboflavin is crucial in the production of body energy. Riboflavin also has antioxidant qualities. This is why it is important both in inner breathing of our cells where energy is produced and also in the reduction of toxins in our cells. It is available in good qualities in green leafy vegetable, fish, legumes, whole grains and yogurt.

Vitamin B₁₂ (Cobalamin) is a water-soluble vitamin that helps the body form red blood cells, build genetic material and metabolize protein and fat. Vitamin B₁₂ is found only in animal products, 22 percent comes from milk and milk products. (Ladewig, 2008)

A low-fat diet is usually used to help with weight loss or weight maintenance, and prevention and treatment of heart disease, high cholesterol, high blood pressure, cancer and diabetes. Low fat is lower on the food chain. Emphasize whole grains, fruits and vegetables and avoid higher fat dairy and meat products. (Ornish, 2001)

The best source of calcium is milk, yogurt and cheese. About 72% of calcium in the U.S. food supply comes from dairy products.
Carrot is a popular root vegetable, which is highly nutritious. Carrots are nutritional heroes; they store a gold mine of nutrients. No other vegetables contain as much carotene as in carrots, which the body converts to vitamin A. Carrot’s secret weapon is provitamin A beta-carotene, and they’ve got quite a stockpile. Just one cup of carrots provides over 680% of the U.S. recommended daily allowances of these antioxidants. In the liver, beta-carotene is converted to vitamin A, used by the retina to form rhodopsin, a purple pigment necessary for night vision. Vitamin A also provides protection against macular degeneration and senile cataracts, which can lead to blindness in old age. (Levin, 2007)

Carrot is one of favourite juice ingredients. It not only tastes good, it has so many health benefits and is highly cleansing. I know many who are against juicing carrots because of its "high content of sugar". But even if you have diabetes, carrot juice is a good blood sugar regulator. Two or three large carrots daily would not cause any adverse effect (but diabetics should keep to just one carrot a day). No doubt the sugar content in carrot is high, but they are natural sugar which is easily assimilated. Fresh carrot juice has a glycemic index count of 80 which is at an acceptable borderline. However, its consumption is encouraged for its rich nourishment and carotenoid content which actually helps balance blood sugar.

Carrot is one of the most healing foods that provide the finest and highest quality in nutrients, especially from its juice. It is an excellent source of pro-vitamin A, vitamins C, D, E, K, B₁ and B₆. It is rich with biotin, potassium, calcium, magnesium, phosphorus, organic sodium and some trace minerals. The known phytonutrients in carrots are lutein, lycopene, anti-oxidants alpha, beta and gamma carotenes, zeaxanthin and xanthophyll. These phytonutrients are nature's marvelous provision for healing of various diseases. (Marker, 2002)

**JUSTIFICATION:**

Eating yogurt everyday is very healthy for the body. Yogurt is a good source of calcium, protein, riboflavin, vitamin B₁₂, and phosphorous. Yogurt was prepared by the incorporation of carrot pulp as carrots are rich in antioxidants (beta-carotene, alphacarotene, phytochemicals and glutathione), vitamin A, B, C, D and E. They are also a good source of folic acid and magnesium. Nutrients found in yoghurt are good for people who are on cholesterol lowering diet or just simply watching their weights. Fermented milks as therapeutic agents in the treatment of gastrointestinal disorder and other ailments
(cardiovascular diseases, cancer, hypocholesterolemic, lactose intolerance, indigestion) were recognized in the ayurvedic system of medicine in India.

OBJECTIVES:

1) To prepare low fat frozen yoghurt incorporated with carrot pulp.
2) To evaluate the organoleptic quality of low fat frozen yoghurt incorporated with carrot pulp.
3) To assess the microbial and nutritional quality of low fat frozen yoghurt incorporated with carrot pulp.
4) To estimate the cost of prepared low fat frozen yoghurt incorporated with carrot pulp