CHAPTER-I

“Part of the secret of success in life is to eat what you like and let the food fight it out inside” - Mark Twain

INTRODUCTION

In today’s world, most deaths are attributable to non-communicable diseases (32 million) and just over half of these (16.7 million) are a result of Cardio Vascular Diseases (CVD) and more than one third of these deaths occur among middle-aged adults. In the developed countries, heart diseases and stroke are the first and second leading cause of death among adult men and women. Cardio vascular diseases are the world’s largest killers, claiming 17.1 million lives a year (WHO, 2003).

In India 2.27 million people died due to CVD during 1990 and according to projections the number of deaths due to Ischemic Heart Disease has increased from 1.17 million in 1990 to 2.03 million by 2010. The prevalence of CVD is reported to be 2-3 times higher in the urban population as compared to the rural population. Almost 2.6 million Indians are predicted to be dying due to Coronary Heart Disease (CHD) which constitutes 54.1% of all CVD deaths in India by 2020 (WHO, 2002).

The present mortality rates are the consequence of previous exposure to behavioral risk factors such as inappropriate nutrition, insufficient physical activity and increased tobacco consumption. Unhealthy dietary practices include a high consumption of saturated fats, salt and refined carbohydrates, as well as low consumption of vegetables and fruits and these tend to cluster together. It is now generally agreed that diet governs many situation in favoring the onset of “heart disease”, particularly coronary heart disease. Of all the factors associated with CHD; namely plasma cholesterol, high blood pressure, cigarette smoking, lack of physical activity, plasma cholesterol has a very high statistical significance with the incidence of CHD. The risk of CHD appears to increase as the plasma cholesterol concentration rises. In addition trials on the effect of dietary changes on CHD have suggested that altering the fatty acid composition of the diet in favour of greater intake of poly unsaturated fatty acids (PUFA) and less intake of saturated fats, while restricting the
intake of fat calories to less than 30% of the total calories, may lower the risk of CHD (Park, 2009).

In the United States, consumption of diets high in whole grains has been reported to have health benefits, such as reduced risk of CVD (Truswell, 2002).

The physiological benefits of the consumption of whole grains include reduced transit time of foods, which may reduce the risk of colon cancer (Bruce et al., 2000) and reduced absorption of nutrients (Bridges et al., 1992), which may reduce glucose and insulin response, and thus the risk of obesity (Wisker et al., 1992).

Whole grain consumption is associated with a 21% reduction in cardiovascular disease when compared to minimal whole grain intake, according to a 2008 review article in Nutrition, Metabolism, and Cardiovascular Disease (Mellen et al., 2008).

Consolidation of five very large cohort studies conducted between 1996 and 2001 in USA, Finland and Norway reported that the subjects consuming relatively large amounts of whole grains cereals have significantly lower rates of CHD. “Eating plenty of cereal foods, preferably wholegrain and without added fat, salt or sugar”, can be found in several sets of national dietary guidelines. If people increase their intake of these cereal foods it would contribute to reduce the national burden of CHD (Truswell, 2002).

Several of the nutrients, the linoleic acid, fibre, vitamin E, selenium and folate in cereals have been known potential for reducing risk factors for CHD. Cereals also contain phytoestrogens of the lignan family and several phenolic acids with antioxidant properties. The processing generally reduces the content of these nutrients and bio-protective substances. Although the cereals, at the farm gate, are very low in salt, processed cereal foods are high salt and thus contribute to raising blood pressure. The predominantly polyunsaturated oil (50% linoleic acid) and, possibly, some of the fiber could lower plasma LDL cholesterol, the vitamin E, selenium and folic acid might lower plasma homocysteine (Truswell, 2002).

Khatkar et al., (2009) reported that cereal grains are consumed as staple foods throughout the world. Their incorporations in a wide range of food products are of great economic importance and have numerous industrial applications, particularly
in the areas of food processing and marketing. In India, wheat and rice are the most important cereals in terms of production and consumption. In addition, maize, sorghum, barley, oats and millets are also consumed as human foods in different parts of the country. The traditional food uses of whole grain cereals include unleavened breads, leavened breads, porridges, pasta, noodles, cookies, soups, boiled meals, fermented food such as idli and dosai.

Jones (2006) research relating to health benefits of cereals products are reviewed with particular reference to whole grain foods. The aspects considered for research include: epidemiological evidence for health benefits of whole grain foods (potential protective effects against all-cause mortality, cardiovascular diseases, ischaemic stroke, metabolic syndrome, type 11 diabetes and insulin resistance); contribution of different nutrients to health effects of whole grain foods (significance of fermentable carbohydrates, beneficial fats and fatty acids, antioxidant compounds, phytochemicals, antimutagens and immune boosters); and benefits of fortifying refined cereal products with folic acid and other B group vitamins (association with reduced risk of incident hypertension, coronary heart disease and colorectal cancer).

Recommendations by numerous organizations and authorities suggest that we consume at least three servings of whole grains (3 ounces) per day in order to receive the healthful benefits of the whole grain provided (U.S. Department of Agriculture, 2005).

Rice is an important staple food in Asian countries. In rural areas, it is also a major of micronutrients (Jianfen et al., 2008). Rice is considered a rich source of dietary energy and good source of thiamin, riboflavin and niacin. Un-milled rice contains a significant amount of dietary fibre. The amino acid profile of rice shows that it is high in glutamic and aspartic acid, while liacin is the limiting amino acid. The nutrient content of rice makes it suitable food to impart health benefits. The continuous efforts of the rice processing and food technology scientists have provided a number of emerging technologies for drying, milling, curing and rice based products. The production alone is not enough to meet growing demand of the quality rice and its products. The newer techniques of processing are equally important to maintain quality of the milled rice and produce high quality products. In recent years,
a number of processing technologies have been developed for rice milling and its products (Patil and Singh, 2008).

Rice is largest consumed caloric source among the food grains. Now a days people are with improper eating habits and depending on the polished and highly refined mono cereal soft diet devoid of fiber. These types of diet contain high carbohydrate and fat. They are easily digested and absorbed by the body, so it increase the glucose and fatty acid metabolism which increases the incidence of degenerative diseases. To prevent these disorders, inclusion of different multi and whole grains are important. Combinations of grains are rich in micronutrients and prevent deficiency diseases.

Rice and pseudo-cereal are important food crops in the Indian subcontinent. In the changing demographic scenario, cardio vascular disease, diabetes mellitus and obesity are likely to become epidemics and this may lead to increased consumption of cereals such as brown rice, Italian millet and samai in whole grain form, as they are helpful in managing these physiological disorders by lipids.

The coarse cereals contain tough and fibrous seed coat, and the seed coat contains polyphenols, phytate and astringent components. Because of these, the food items prepared from their whole meal have low consumer appeal. Processing (dehusk and polishing) of these cereals has overcome these disadvantages and improves their overall acceptability and nutritional quality (Desikachar, 1980; Klopfenstein et al., 1991 and Dendy, 1995).

Cereal and pseudo-cereal products prepared from brown rice, Italian millet and samai were not available in ready-to-use form and has further limited their use and acceptability.

Thus, at the present era of food scarcity, there exists a need to diversify the use of these cereals by developing non–conventional food products (Srivastava et al., 2001), especially, for the adult prone to cardiovascular disease.

Traditional foods, such as idli, pittu and porridge, consumed by most of the population, are preferred for this study. The cereal foods are prepared by using
minimum amount of salt and sugar and without added fat suitable for cardiovascular disease people.

The selected cereals and pseudo-cereals are rich in fibre and essential fatty acids which have an impact on reducing serum cholesterol and triglycerides, which is risk factor for heart disease. The cereal and pseudo-cereal food products are developed, based on inexpensive, locally available cereals, and they are an excellent way to reduce hyperlipidemia. In this study, the prepared cereal and pseudo-cereal products can be easily adopted at household level and it could attract the attention of the researchers engaged in food and food products based on brown rice and millets that have potential for scaling-up their commercial exploitation in the Indian context.

In the light of the above discussion, “Standardization of cereal and pseudo-cereal products and their effect on hyperlipidemia in wistar rats” was undertaken with the following objectives:

**OBJECTIVES**

1. To study the physico-chemical properties of selected cereal and pseudo-cereal.
2. To develop cereal and pseudo-cereal products such as *idli, pittu and porridge* and study the acceptability of the developed products.
3. To study the physical parameters of the developed products.
4. To study the nutrient content of the cereal and pseudo-cereal products.
5. To study the cereal and pseudo-cereal effect on hyperlipidemia in wistar rats.
6. To carry out storage studies on these cereal and pseudo-cereal flours.