# Chapter - I

## INTRODUCTION

Parboiling of paddy is an ancient process, most probably invented to make the hulling or removal of hulls easier. The process is essentially a method of precooking the rice kernel within the hull. The application of moisture and heat brings about some changes in the rice grain which were incidental, but have turned out to be benefitial in many respects. These changes, either physico-chemical, biochemical or nutritional, have attracted considerable attention and stimulated scientific research for explaining the behaviour of the parboiled rice.

The advantages accruing from parboiling of rice include a harder grain that reduces breakage during milling and increases head rice yield, a translucent, albeit yellowish, grain attractive to many classes of consumers, somewhat greater resistance to insect attack in storage, better cooking qualities and higher nutritional status of the grain.

Due to the uneven distribution of the chemical constituents in the kernel, with higher concentration of the nutrients in the outer layers, polishing, particularly a higher level of polishing, depletes the

grain of its valuable nutrients that are removed with the bran. Also, cooking practices normally followed wash away much of the nutrients. Parboiling seems to restore or rather check the erosion of nutritional status of the rice kernel.

The enrichment of bran by an increase in its oil content, a higher vitamin content and protein content in the nucleus (milled rice) as a result of parboiling have been studied and the changes mainly attributed to lower admixture of bran with brokens from the starchy endosperm. The possibility of migration of some of these constituents during the process of parboiling has also been suggested. There are, however, no definitive evidences, at least for some of these constituents, to decide with certainty whether or not the hydrothermal treatment induces these changes.

Pressure parboiling is a relatively new technique in the area of parboiling. Briefly, the process consists of rinsing the paddy with water followed by steaming under a relatively high pressure. The process thus practically eliminates the soaking step and reduces the time required for the process to complete. However, the process as practised today in some parts of the country suffers from a serious drawback. Rice produced by this process is not only too discoloured but also very hard - so much so that it becomes difficult to cook to a soft

texture. These defects can be eliminated by carefully controlling the conditions of parboiling.

The most obvious physico-chemical change that occurs during parboiling of paddy is the gelatinization of starch which is the major constituent of the rice grain. The extent of gelatinization of the entire mass of starch is thought to influence some of the properties of the finished product. Important among these are the hydration and solubility behaviour.

On the basis of some of the observed differences in the behaviour of parboiled rice from that of raw rice and among rices of different degrees of parboiling, theories have been proposed to explain the mechanism involved in or following the process of parboiling in altering the behaviour of starch. One of the theories suggests, and there are evidences for it, that the starch undergoes gelatinization which under some conditions may be followed by retrogradation of the starch. The other theory or school of thought relates to solubilization of at least a portion of starch followed or accompanied by formation of complex(es) with fatty molecules. Some properties of the parboiled starch cannot be explained satisfactorily by the first school of thought. The area therefore offers an opportunity to reopen this question for a satisfactory answer.

A systematic study of some of the physico-

chemical changes, the relative distribution or redistribution of some of the nutrients in the kernel and the effect of parboiling, particularly pressure parboiling, on these and on the behaviour of the grain, therefore, seemed to be in order. Accordingly, a series of experiments were conducted with the following specific objectives.

i) To study the physico - chemical changes in rice produced by parboiling of paddy under combinations of different levels of steaming pressure and steaming time.

ii) To study the effect of parboiling methods on the relative distribution of protein and fat in the grain and its milled products.

iii) To study the changes in the behaviour of starch in the rice grain during and/or following gelatinization.

iv) To propose, on the basis of results, the possible mechanism or mechanisms involved in gelatinization of starch during parboiling of paddy.