Chapter - I

I N T R O D U C T I O N

INTRODUCTION

India has been plagued by a chronic shortage of edible oils and the state has to spend sometime its valuable foreign exchange in meeting the import cost of such oils. Both industry and the government are seized of this situation and considerable efforts have been directed toward increasing production in the country. R and D efforts at the government as well as industry levels are also being geared to deal with the problem.

Acreage on the traditional oil seeds such as mustard, groundnut, etc cannot be increased indefinitely; improved cultural, production and management practices have been attempted with some success toward increased yields. The total production, however, still remains far short of the requirement. A viable alternative is to accelerate efforts toward evolving subsidiary sources of oil. In this respect, rice bran which may yield upto 30 per cent oil can be utilized to advantage.

Preliminary investigations in this laboratory and elsewhere have indicated the existence in the rice kernel of a certain degree of variability in the thickness of bran layers (Raghavendra Rao *et al.*,1965; Mukherjee and Bhattacharjee 1978), in the yield of oil and in the level of activity of the lipolytic enzyme, in a few varieties studied. Considering the fact that there are some eight thousand or more varieties of paddy in India, and even granting that a large number of these are only synonyms, there is a tremendous source material which can be screened for varieties with possible higher oil yields and low inherent lipolytic activity. Also, many of these varieties may turn out to have grain of higher milling and cooking quality. This is an area requiring meaningful research investigation. Successfully executed, research on this aspect may help in finding means of increasing the oil yield on the one hand and, on the other, reducing the cost of stabilizing bran for economic extraction of oil. Hopefully, by the time the complete information is made available, a preference may be generated among millers and extractors for such varieties for easy and fuller utilization of their grain and by-product.

A major constraint in the effective utilization of rice bran for oil extraction in India and perhaps elsewhere in South and South East Asia is the rapidity with which the bran upon milling develops free fat acidity and renders it unfit for economic extraction. This is one major reason why a vast potential of source material remains unutilized. Out of an estimated potential of 700,000 to 1 million tonnes of oil which India can produce annually, only 10 per cent or about 70,000 tonnes is now produced. Of this again, about 5000 tonnes is of edible grade, the rest being used in the soap industry (Jaju, 1977). Considering the fact that properly processed rice bran oil has an excellent quality and that the trend of paddy production in the country is still rising, it will be a tremendous achievement even if the oil produced today is of edible grade.

The main problem in processing of rice bran is the degrative rancidification involving lipolytic (lipase) and oxidative (peroxidase) enzymes. The lipase splits the fat into free fatty acids which are more susceptible to oxidative break-down than the neutral lipids. Control of lipase and especially of peroxidase activity is, therefore, important if the oil from the bran is to be extracted for edible purposes.

Because of scattered nature of the rice mills in the country and location of the solvent extraction plants in centralised places, the collection and subsequent extraction of the bran within a reasonable time after milling to avoid deterioration become extremely difficult and, more often than not, impossible. This has led to rice bran being wastefully utilized as feed and fuel, despite its massive industrial and nutritive potential.

The solution lies in the stabilization of the bran before transportation and for such time as would be imperative for storage before the substrate, that is oil, is separated from the enzyme, that is lipase and peroxidase, by solvent extraction.

Of the various methods used so far for rice bran stabilization, namely chemical, irradiation, refrigeration, extrusion cooking, etc, the most promising still appears to be inactivation of the enzyme system by heat treatment.

Additional advantages of heat inactivation are that it can simultaneously kill bacteria, molds and insect eggs which are secondary sources of deterioration (Desikachar, 1974). Heat treatment also agglomerates the bran into coarser and flakier particles preventing the fines problem during solvent extraction (Williams and Baer, 1965).

Inspite of several methods of heat stabilization of rice bran being reported in literature including one from Spain (Barber et al., 1974), a viable process or technology at least for Indian situations (taking all implications into consideration) is yet to come up. While hectic activity continues in India for developing a suitable stabilizer using dry and/or wet heat, it would be worthwhile to investigate into the details of various conditions of moisture content, temperature and duration of heat treatment for arriving at the mildest set of conditions required for inactivation of the enzymes, without appreciably altering the inherent valuable properties of the bran.

The present series of investigations were, therefore, undertaken with the following objectives :

1. a) To study the extent of variation in the level of oil in bran of a large number of paddy varieties.

   b) To study the extent of variation in the level of lipase activity in bran of these varieties.

2. a) To study the thermal resistance of the enzyme lipase and of peroxidase in bran in relation to moisture content, temperature and duration of heat treatment; and thus

   b) to determine the optimum mildest conditions for inactivation of the enzymes.

3. a) To recommend, on the basis of information obtained, the suitable varieties for higher oil output and/or low inherent lipolytic activity.

   b) To recommend conditions for inactivation of the two enzymes.