Introduction
INTRODUCTION

The bulk of Indian diet is vegetarian in nature and the major part of energy and protein comes from cereals and pulses. The role of cereals and pulses is so important in our diets that a series of products had evolved in the Indian culinary based on the combination of cereals and pulses. These cereal-pulse based foods have gained a prominent place in our everyday diets.

These foods use many combinations of cereals and pulses and employ a wide range of cooking practices such as boiling (e.g. Khichdi a popular food consumed all over India), shallow pan frying (dosa of south India), deep frying (Khasta kachori of the north), and foods prepared by fermentation and steaming (idlis of south India and dhokla of the west India). The ratio of cereal to pulse in some of these foods (e.g. 4:1 in dosa is closer to that recommended by the Indian Council of Medical Research for vegetarian diets (Gopalan, 1989).

Handwa, a traditional Gujarati food, also belongs to the category of cereal-pulse foods and is made by baking the fermented batter prepared by adding water to a ground mixture of rice, bengal gram and red gram dals. The product is also popular in the neighbouring states and is consumed regularly as a major meal of the day, whereas the leftovers are generally served as breakfast or snack.

Handwa has a potential of developing into a popular
nutritional food item throughout India due to its certain unique advantages in the form of utilising a variety of spice combinations to suit regional tastes and different choices of major and minor ingredients to balance the nutritional needs of various target populations including adults, adolescents and school age children.

So far, little systematic work has been reported on the technology of this popular traditional product. From a few recipes in the cookbooks (Dalal, 1982; Sheth, 1990; Shah, 1990; Gajjar, 1990; Mehta, 1992), handwa appears to exhibit a wide variation in the choice of ingredients, their relative proportions, and preparation methods. This is likely to result in the finished products that are far from being uniform. Since Handwa is a household product, information on the consumption, preparation and storage practices through household survey will help in understanding the basic handwa making technology.

The preparation of handwa involves dry grinding of cereal-pulse mixture, followed by the preparation of the batter by adding water to the ground mix flour, fermenting the batter, seasoning and finally baking. Establishing the criticality of these operational parameters is necessary to understand the effect of their modifications on the quality of handwa, that would appeal to the preferences of various regions and meet the nutritional needs of different target groups.

In the area of food product development, the scope of
substitution, fortification and supplementation with nutritionally and/or economically better alternatives continues to be important. Ramakrishnan et al. (1979) reported wheat, maize and kodri as suitable substitutes for rice in dhokla preparation and soybean, peas and mothbeans for bengal gram. Fortification of cereal-pulse based fermented batter with vegetables have been successfully attempted by Rajalaxmi et al. (1973). The nutritional losses that occur by cooking these vegetables were minimised by such incorporation. Hence understanding the role of cereals, pulses, and additives such as vegetables on handwa quality merits a systematic study.

Since the protein quality of cereals and pulses is low due to the imbalances in their amino acid content (Rao et al., 1970), efforts are being made in many ways to improve the protein quality of cereal-pulse combinations. A relatively simple way of improving the protein quality of a diet is by a judicious combination of cereals and pulses. A mixture of wheat, soybean, and peanut having 26% protein have shown to be optimal for rat growth (Narayanswamy et al., 1974). A blend of bengal gram and rice containing 9.6% protein showed a higher PER of 2.88 to 3.0 as against the PER of 1.8–2.0 for rice alone (Daniel et al., 1974).

Further, improvement in the protein quality in cereal-pulse foods through germination has been reported by many. Several workers (Tsai et al., 1975; Dalby and Tsai 1978; Wu and Wall, 1980; Wu, 1983) have reported an increase in lysine and tryptophane contents during the germination of cereals and pulses

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Besides its effects on the amino acid profile, germination also brings in other important changes in the grains that are used to the advantage of various products. For example, amylase rich foods (ARF -a dehydrated powder prepared from germinated cereals), decrease viscosity of cereal based weaning food gruels, primarily due to its amylase activity (Gopaldas and Deshpande, 1992). Using similar approach, the quick cooking dals have been developed from the germinated pulses (Chakraborty et al., 1992). Such germinated pulse flour may also have significant effect on the nutritional and cooking quality of handwa.

Cooking of cereal-pulse based foods by boiling, steaming, shallow frying, and deep frying not only influences the sensory attributes of the finished products but also their nutritional quality, depending on the time-temperature combinations used for various treatments. The most drastic effect of heat is usually in the frying process, particularly on the surfaces of the food pieces. Similar effects at the surface, such as browning in bread, and darkening in handwa are also considered to be desirable characteristics of these baked foods. Since these are performed at a relatively higher temperature and for longer duration, baking might be somewhat detrimental to the nutritional quality of handwa, especially in terms of vitamins and certain aminoacid levels, compared to such effects in idlis and dhoklas that are steam cooked for relatively short time-temperature combinations. It is therefore worthwhile to consider the scope of introducing steaming (for cooking) along with baking (for the browning finish).
Baking of handwa is largely carried out in the traditional handwa pot. However, with the emergence of newer baking devices, such as microwave oven, and solar cooker, their use for handwa preparation awaits standardisation. This may add to the convenience of handwa making in other parts of India, where traditional handwa pots are not available.

The convenience foods are gaining popularity in the Indian homes, since such foods are either ready to consume as such or which require very little preparation. The popularity of these mixes depend on the degree of convenience added to these foods. In the cereal-pulse food categories, ready-made mixes are now available for idlis, dosa, vada, etc. Even handwa mixes have appeared in the market. However, the only convenience in the handwa mixes (those available at the flour mills) appears to be largely in the form of eliminating the step of grinding of the cereal-pulse grains. Many of these mixes still require long fermentation step, the addition of vegetables and seasoning prior to baking. Eliminating some of these steps will increase further utility of these mixes as convenience food.

Critical to the marketing of such convenience foods is the effective use of appropriate packaging systems to be selected from a series of low cost, flexible food grade plastic packaging materials that are in use in India (Agarwal, 1988). Their choice will have to be ultimately based on their effect on the shelflife characteristics of these mixes and the quality of end product.
Handwa is usually prepared for fresh consumption, and the leftovers are mostly used up on the following day. It is however necessary to see how the storage of handwa can be optimised with particular reference to refrigerated storage vis-a-vis ambient storage conditions and how safety can be ensured by observing the kind of spoilage it undergoes during storage.

It was therefore proposed to undertake a survey of the preparation, consumption, and storage practices of handwa in Baroda based Gujarati households, to standardise handwa manufacturing technology, to study the effect of technology modifications such as supplementation, fortification etc. on handwa quality, to develop ready-to-bake mixes, to study their shelf-life in flexible packaging systems, and to prepare handwa for various target groups from nutritionally balanced formulations.