INTRODUCTION
1. INTRODUCTION

Millet cultivation has a great potential in areas of unpredictable and low rainfall. Advances made during past few years on these crops have made them remunerative and competitive with other cereals under rainfed agriculture.

Sorghum, pearl millet and finger millet have received the attention of agricultural scientists and nutritionists for a long time. But some of the small millets like Foxtail millet / Italian millet (Setaria italica Beauv.), French millet / Proso millet (Panicum miliaceum Linn.), Barnyard millet (Echinochloa frumentacea (Roxb.) Link., Kodo millet (Paspalum scrobiculatum Linn.) and Little millet (Panicum miliare Lam.) have not been much investigated for nutrient composition (Geervani and Eggum, 1989).

Small millets are grown in China, India, Russia and several countries of Africa. In India, they are grown in fertility depleted soils as a single crop or as mixed crop. In tribal areas millet is cultivated on slopes of hills (Geervani and Eggum, 1989). The production and consumption of millets have persisted to a greater extent in Eastern Europe and Russia, where they are still used in certain parts for cooking, baking, brewing or for other purposes. They form staple food for millions of people in Africa, Asia including India (Rachie, 1975).

In India, the production of small millets is 9.52 lakh tonnes and in Tamil Nadu alone it is 0.88 lakh tonnes (Anonymous, 1993). The nutritive value of millets is comparable to other cereals. Some of them are even better with regard to average protein and mineral contents (Gopalan et al., 1971). Although millets are nutritionally superior,
the non-availability of refined and processed millets in ready-to-use form has limited their wider use and acceptability. Millets are, therefore confined to traditional consumers and also to the people of lower economic strata (Desikachar, 1977).

The cold-water-insoluble starch granule forms the major constituent of cereal, millet and small millet grains. Being a macromolecule composed entirely of $\alpha$-D-glucose, this polysaccharide is readily assimilated in the human system; in fact, a very high proportion of the world's food energy intake is starch. Starch granules are composed of two chemically distinguishable entities amylose, a linear polymer and amylopectin, a highly branched polymer (Adkins and Greenwood, 1966).

Lorenz and Hinze (1976) isolated and characterised starch from proso millet and compared it with wheat and rye starches. The millet starch has higher water-binding capacity and gelatinisation temperatures than wheat starch. Scientific information on the carbohydrate make-up, particularly the starch component of small millets is limited (Muralikrishna et al., 1982).

The bioavailability of starch is at present an issue of much nutritional concern. Different starchy food items differ considerably in the rate and extent of starch uptake in the human small intestine (Jenkins et al., 1987a). A reduced rate of starch uptake is particularly beneficial to diabetics, because a lowered post prandial glucose response lowers the insulin demand (Jenkins et al., 1983). A somewhat incomplete total digestibility may also be nutritionally advantageous as the malabsorbed starch reaching the colon could exert physiological effects similar to those of dietary fibre (Jenkins et al., 1987b).

Jenkins et al. (1981, 1985 and 1988) have reported that the carbohydrate foods are digested and absorbed at different rates. Those which are digested and absorbed at a
slower rate have been suggested to be more beneficial to health and better control of chronic diseases such as diabetes, cardiovascular diseases and cancer (Panlasigui et al., 1990).

It is known that the gelatinisation behaviour of the starch granule is affected by its amylose content. Recently it was demonstrated that a close correlation exists between the degree of starch gelatinisation and the rate of enzymic hydrolysis both in vitro and in vivo (Holm et al., 1988).

Heat processing of starchy foods increases the digestibility of starch (Ring et al., 1988). However a fraction of the starch may also be rendered resistant to mammalian digestive enzymes and thus escapes digestion. Retrogradation of amylose during heat treatment is believed to lead the formation of resistant starch (RS) (Berry, 1986; Ring et al., 1988). The occurrence of RS in foods may have a significant health implications especially if the diet is modified as recommended to include more complex carbohydrates (starches and fibre) or if RS is added to foods as a fibre component (Cronin and Shaw, 1988). Even when not added as a fibre compound, the formation of RS in traditional foods can be substantially enhanced, if desired by modifying selected processing parameters. When present in significant amounts RS lowers the caloric density of foods, RS is also reported to elicit a low glycemic response (Ring et al., 1988). In addition RS can modify the intracolonic environment to favourably alter toxicological function (Mallet et al., 1988). It may also provide protection against colorectal cancer by shortening intestinal transit time and providing faecal bulk (Burkitt et al., 1972).
Since, the information available regarding starch and resistant starch in small millets is lagging behind, the present investigation was aimed with the following objectives.

1. Determination of starch, amylose, amylopectin, sugars and dietary fibre in five different small millets.

2. Study on the degradation and accumulation of starch, amylose, amylopectin and sugars during germination and development respectively.

3. Isolation of starch to study their characteristics through *in vitro* digestion by *α*-amylase, scanning electron microscope and Brabender viscoamylograph.

4. Determination of chain length of amylose and amylopectin in starches of small millets.

5. Comparative study of the treated starch from small millets on intestinal responses, blood glucose, serum cholesterol and triacylglycerol level in rats.

6. Determination of glycemic index of native and treated starches prepared from five small millets in diabetic and non-diabetic humans.