ABSTRACT

The present study aimed at reducing the dietary bulk of traditional gruels with malted cereal flours known as Amylase Rich Foods (ARFs) and feeding the low and high bulk gruels (with and without ARF) to infants and toddlers (6-24 months) to determine their intake of these gruels and their effect on growth.

ARFs were prepared from pearl millet and wheat. Pearl millet was soaked in water for 2 hours, germinated for 72 hours and roasted over an open fire in an iron pan for 10 minutes at 70-80°C or oven-dried for 5 hours at 50°C or sun-dried for 5 hours at 40°C ± 2°C. The dried grains were milled to a fine powder of 80 BSS. The sun-dried ARF showed the highest amylase activity followed by oven-dried ARF. Minimum amylase activity was observed in the roasted ARF.

Wheat ARF was prepared by soaking the grains for 12 hours, germinating for 48 hours, oven-drying at 50°C for 5 hours and milling the dried grains to a fine flour of 80 BSS. Wheat ARF showed the highest amylase activity (4500 mg of maltose units/g of ARF) as compared to any other ARFs studied in this department.
Viscosity measurements with different concentrations (1-7 g% of total solids) of pearl millet and wheat ARF on 10, 15, 20 and 25 per cent solid concentration rice gruels was studied. It was observed that at all concentrations maximum viscosity reduction was brought about by 4% of solid concentration of ARF. Although both the ARFs were effective in reducing the viscosity of the rice gruel, wheat ARF performed better than pearl millet ARF. Therefore, wheat ARF was utilized for further work in this study.

When wheat ARF was added to a 50 g% wheat gruel at levels 4% or below it did not affect reduction in viscosity. However on increasing the amount of ARF, optimum viscosity reduction was brought about when ARF was incorporated at 6% of total solids.

Wheat ARF at 4% level was effective in bringing about optimum reduction in viscosity of different solid concentrations of sago and Soya Fortified Bulgar Wheat (SFBW) gruels. When the amylolytic action of wheat ARF was compared with takadiastase, wheat ARF was more effective than the pure enzyme in reducing the viscosity of sago gruels. Addition of wheat ARF to whole sago gruel had similar effect in reducing its viscosity as compared to sago flour gruel. Addition of wheat ARF to sago and SFBW gruels prior to and after cooking did not show any difference in the viscosity reduction.
Addition of fat and jaggery increased the energy density of both sago and SFBW gruel, maximum reduction in viscosity was observed when ARF was added to the gruels.

Different methods of milling employed for SFBW namely, traditional stone grinding, milling in a commercial plate mill and milling in a laboratory based mini plate mill did not have any influence on the amylase activity of the ARF and its subsequent reduction of the dietary bulk of the gruels from different flours.

When wheat ARF at 4% of total solids was added to different concentrations of "Khichdi" and "Chapati" flours, it was observed that in the Khichdi flours, there was a 40% reduction in viscosity while in the Chapati flours, there was an 80% reduction in viscosity. This was also obvious visually when ARF was added to the mashed Chapati gruels.

Commercially processed foods like biscuits and bread were subjected to ARF treatment and it was observed that highest reduction in viscosity occurred in bread gruels followed by low and medium fat biscuits while high fat salty biscuits showed minimum reduction in viscosity.

Acceptability and intake trials of infants and toddlers (6-24 months) with ARF and non-ARF gruels of sago, SFBW and wheat showed that the ARF gruels were better accepted and
consistently consumed at significantly higher levels as compared with the non-ARF gruels.

A six month feeding and growth trial was carried out on infants and toddlers (6-24 months). Thirty four pairs of child subjects, pair matched for age and nutritional status were fed with 20 g% solid concentration of wheat gruel with and without ARF (34 subjects each). At the end of the study only 21 pairs of child subjects completed the entire study period of six months.

The feeding trial with ARF and non-ARF gruels showed that the ARF gruel fed children namely the Experimental group consumed significantly higher amounts of the gruel than the non-ARF gruel fed children namely the Control group. Consumption of the ARF gruel increased as the study period advanced. Data on the morbidity profile shows that although the frequency of illness was the same in both the groups of the child subjects, the Experimental children recovered faster than the Control children. No illness among the child subjects was observed during the winter months.

The ARF gruel helped to improve the overall consumption of energy and protein among the child subjects. Almost 20% of RDA for energy and protein was provided with the ARF gruel as compared to only 5% of RDA from non-ARF gruel.
Studying the growth pattern of the subjects fed with the Experimental and Control gruel, it was observed that the Experimental children gained significantly in weight, height and mid-upper arm circumference (MUAC) as compared to their Control counterparts. The improvement in weight was more significant in the first and the sixth month of the study. Weight gain was more marked than height and MUAC. This aspect is again observed when wasting and stunting categories were compared at baseline and final stage for the Experimental group; there was a significant improvement in wasting as compared to stunting.

Nutritional status of the children improved considerably in the Experimental group as compared to the Control group. There were more children from the Control group in the malnourished category than in the Experimental group. The number of children in the normal nutritional status doubled for the Experimental group of children. While in the Control group, there was a deterioration in the normal nutritional status of children after the 6 months feeding trial. Energy and protein intake per kg body weight of the child subjects was evaluated and the results showed that in the Control and the Experimental group, protein intake was similar at baseline and final evaluation. Energy intake on the other hand showed considerable difference in the Control and the
Experimental group. The Experimental children consumed 72.1 kcals/kg body weight and the Control group received 63.5 kcals/kg body weight at final evaluation.

The controlled feeding trials have conclusively demonstrated the efficacy of the Experimental gruels (ARF gruels) in substantially improving the nutritional status of the young child subjects (6-24 months). It is therefore suggested that this simple and feasible household level technology to reduce the dietary bulk of traditional gruels, be employed on a much wider scale.