

## Development of a Cereal Incorporated Yoghurt

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### Introduction

Yoghurt, thought to have been part of Balkans and the Mediterranean countries for a longer time in the history (Early, 1998), is a popular nutritional healthy food serves as a snack and a dessert. Yoghurt is a fermented milk product which is partially digested by microorganisms. Under the standard of identity established by the U.S. Food and Drug Administration (FDA), in order for a refrigerated product to be called "yogurt," it must be produced by culturing permitted dairy ingredients with a bacterial culture, which contains *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. In addition to the use of bacterial cultures required by the FDA standard of identity, live and active culture yogurt may contain other safe and suitable food grade bacterial cultures. Yoghurt has a higher nutritional profile and known to have many health benefits. Yoghurt is a good solution for lactose intolerance, due to several factors including the activity of live bacteria in the yogurt or the digestive action of other enzymes on lactose such as bacterial  $\beta$ -galactosidase. The increased viscosity of yogurt compared with milk has also been suggested as a potential explanation, as this may result in slower emptying from the stomach and thus a longer transit through the gastrointestinal tract, which in turn may improve the absorption and reduce the amount of lactose present in the colon. Studies have also shown that consumption of milk and dairy foods as part of a calorie controlled diet is associated with increased weight loss, particularly from the abdomen, amount of lactose present in the colon. Yoghurt is healthy option for obesity. The action of probiotics is another health benefit of yoghurt. Probiotics can exert a positive effect on health by redressing the balance of health-promoting and pathogenic bacteria in the gastrointestinal tract.

Cereals are grasses cultivated for edible components of their fruit seeds. Cereals play an important role in meals. Rice varieties are staple food of Asians. Many cereals have a very good role in the breakfast and snacks in other corners of the world. Focusing on the nutritional factors, cereals are known to possess dense nutritional properties with less calories and sugar. They manage the blood sugar levels and body weight. Cereal plays major roles in health by reducing the risk of coronary heart diseases and cancers of stomach and colon. A cereal with milk is a leading source of nutrients in children's diet.

Incorporating both nutritional sources, this study was aimed to develop a ready – to – serve cereal incorporated yoghurt as a new yoghurt product, while adding value to local cereal varieties such as Rice (*Oryza sativa*) and Finger millet (*Eleusinecoracana*). The low fat content and medicinal value of cereals opens a broad market segment for this yoghurt. Considering its health impacts, this yoghurt can be marketed for elders among whom the yoghurt is not much popular.

## Methodology

Fine cereal flour of rice, finger millet, chick pea and precooked Samaposha were selected based on locality, availability and sensory characteristics such as flavor and color. The preliminary studies were conducted by adding cereal types to yoghurt mixture in different proportions of weight (10%, 8%, 6%, 4%, 2%) per volume. The flour added yoghurt types were labeled in respect to the weight proportions decreasing order: rice – R1, R2, R3, R4, R5, Finger millet – F1, F2, F3, F4, F5 Chick pea- C1, C2, C3, C4, C5 and Samaposha- S1, S2, S3, S4, S5. The rice flour combining with other flour types were tested and the mixtures labeled as RF1, RF2, RF3, RF4, RF5, RC1, RC2, RC3, RC4, RC5 and RS1, RS2, RS3, RF4, RF5. The prepared yoghurt mixture consisted, Milk (Fat – 3.3, SNF – 7.95, Equal to Final Volume) Sugar (12%), Gelatin (0.72%). Cereal flour (desired percentage) and the mixture was cultured using *Lactobacillusbulgaricus* and *Streptococcus thermophilus* and fermented at 45 °C until the yoghurt setting point reaches. The time for setting was varied slightly with different cereals and, the pH change and visual observation of expertise were used to determine the setting of yoghurt. The products of the preliminary studies were evaluated by employing 15 untrained panelists of Lucky Lanka Milk Processing Co. Ltd. The five point hedonic scale was used to record the sensory attributes. The experiment was designed as a Complete Randomized Design. Sensory data were analyzed using Friedman Ranked test. By considering the results of the preliminary survey yoghurt types R4, F5 and RF2 were selected as the best. Those three yoghurt types were further treated and sensory evaluation was done by employing 30 untrained panelists and by similar analysis described above. The interpretation was done using sensory profiles.

From the second analysis two types of yoghurts were selected as the best. Following nutritional conditions were analyzed in selected two types: pH (pH meter), SNF (Dried sand method), fat (Gerber test) and crude protein content (Kjeldal method).

Finally the best kind of yoghurt was chosen. The shelf life of the best yoghurt was monitored without adding any preservatives. The routinely took samples were tested for Coliform contaminations and yeast mold counts. These two microbial tests were continued until the results became positive.

## Results and Discussion

The sensory characteristics of yoghurt incorporated with rice flour, finger millet flour and combination of both (60% rice flour, 40% finger millet flour) have obtained best scores in sensory evaluation.

The sensory evaluation of the test has resulted best proportions of flour types. Best proportion for the rice flour incorporated yoghurt was 4% ( $p = 0.003$ ) and for finger millet it was 2 % ( $p = 0.010$ ) However sedimentation of finger millet flour at the bottom of the yoghurt was a negative sensory characteristic. The relatively large particle size of the flour and uneven distribution of the particle among milk caused this problem. However by using finer particles of finger millet flour and proper homogenization of mixture will reduce this problem. Among the combinations of rice flour and finger millet flour (3:2), 8% proportionate yoghurt, consisted with a different texture and mouth feel which was slightly deviated from the conventional yoghurt texture and mouth feel. Moreover, (RF2) this yoghurt has obtained a significant score ( $p = 0.001$ ) at sensory evaluation.

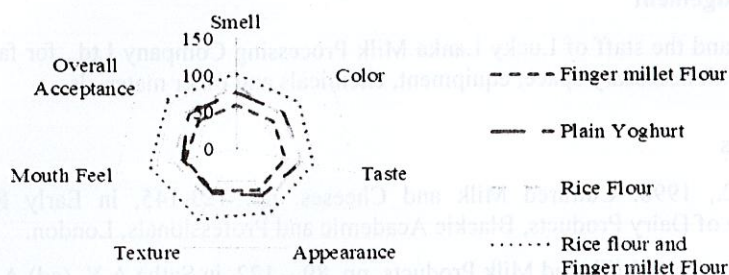


Figure 1: Sensory Profile for Final sensory evaluation

According to the final testing, the significantly best sensory profile (figure 1) was obtained by the 8% rice flour and finger millet flour (3:2) incorporated yoghurt (RF2) with respect to color ( $p = 0.003$ ), taste ( $p = 0.000$ ), appearance ( $p = 0.004$ ), texture ( $p = 0.000$ ), mouth feel ( $p = 0.002$ ), overall acceptance ( $p = 0.000$ ).

The comments of the sensory evaluation had stated that the formula used in that yoghurt has a promising future as a separate product which has better nutritional value, better feeling of weight and better overall acceptance especially among people aged over 35years. In addition, it was also having a chance to replace a meal, especially the breakfast. However, as a cereal incorporated yoghurt, the yoghurt with 4 % rice flour has gained a good yoghurt flavor, yoghurt texture and yoghurt mouth feel. Table 1 shows the chemical properties of best yoghurt formula.

Table 1: Chemical Properties of best yoghurt formula

Parameter	R4	RF2
pH value	4.32	4.52
SNF	19.27%	28.78%
Fat content	2.8%	2.4%
Crude protein Content	3.81%	4.32%

Both yoghurts had higher sensory perception than vanilla yoghurt. The yoghurt incorporated with finger millet flour had the lesser sensory perception that was lesser than the sensory perception of vanilla yoghurt. According to the microbiological tests of the best yoghurt, during first nine days, the microbial count was nill, for both coliforms and yeast mold count. Therefore the shelf life of this yoghurt without the addition of preservatives was 09 days. By improving processing conditions and adding permitted preservatives, the shelf life can be extended.

### Conclusion

The rice flour based finger millet incorporated cereal yogurt had the best consumer preference in terms of color ( $p = 0.003$ ), Taste ( $p = 0.000$ ), Appearance ( $p = 0.004$ ), Texture ( $p = 0.000$ ), Mouth feel ( $p = 0.002$ ), Overall acceptance ( $p = 0.000$ ). However the product features were slightly deviated from yoghurt. The rice flour incorporated yoghurt had not significant but better yoghurt flavor, texture, mouth feel and other characteristics.

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Table 1: Chemical Properties of best yoghurt formula

Parameter	R1	R2
pH value	4.33	4.33
SNF	19.17%	18.78%
Fat content	2.8%	2.4%
Carbs protein Content	1.81%	4.13%

Both yoghurts had higher sensory perception than vanilla yoghurt. The yoghurt incorporated with finger millet had the lesser sensory perception that was lesser than the sensory perception of vanilla yoghurt. According to the microbiological tests of the yoghurt, during the nine days the microbial count was nil for both conditions and yeast mold count therefore the shelf life of the yoghurt without the addition of preservatives was 09 days. By improving processing conditions and adding permitted preservatives, the shelf life can be extended.

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