

## Analysis of Anti nutrient Composition and Enzymatic Activity of Ragi Moth based Infant Premixes



### Home Science

**KEYWORDS:** Germination, Amylase activity, Protease activity

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### ABSTRACT

*Malnutrition is still a significant public health problem in India in spite of advance in economic prosperity which has lead to growth in field of medical therapeutics. Improvement in dietary quality should be major focus for reducing malnutrition. Nutritious germinated premixes can be used for management of malnourished child and Ragi based premixes can be one such alternative..*

### Introduction:

According to WHO Health Report 2005, poor nutrition contributes to 1 out of 2 deaths approx. 53 per cent associated with infectious diseases among children aged under 5 years in developing countries. Malnutrition contributes to about 40 per cent of the 11 million deaths under 5 years age in Developing Countries. Both infant and under-five mortality rates for Indian children ranges to about 67 and 93 percent respectively. One in four new-borns is underweight, only about one in three is exclusively breastfed for the first six months. Nearly one in two children less than five years of age suffers from moderate or severe malnutrition. According to the National Family Health Survey –III (2005-2006), Forty three percent children under age of five years are underweight (low weight for age), 48 percent are stunted (low height for age), 20 percent are wasted (low weight for height); over 6 per cent of these children are severely wasted (<-3SD). The percentage of SAM children is increasing rapidly from birth to 20-23 months; peaking at age 20 months. A complementary food made from cereals is often low in mineral content and contains significant quantities of mineral absorption inhibitors, phytic acid and condensed tannins. Phytic acid forms complex compounds with cations such as zinc, iron, magnesium and calcium at physiological pH of the plant. The mineral-phytic acid complex, phytate, is either insoluble or difficult to hydrolyze during digestion. Phytic acid inhibits absorption of min by humans and other mono gastric animals in a dose-dependent manner. Phytic acid in cereal-based foods can be degraded by adding commercial exogenous phytases or by activating the native phytases by a combination of soaking and germination. In most developing countries traditional weaning foods are based on local staples, usually cereals. For use as weaning foods, cereals are normally made in to gruels. During the cooking process, the starch granules swell and bind a large amount of water, resulting in gruel of satisfactory feeding consistency will contain a great deal of water and have a large volume relative to its content of solid matter. If the concentration of solids is raised to increase the nutrient and energy density, the gruel will be too thick and viscous for a small child to eat easily. This high volume/high viscosity characteristics, referred to as dietary bulk, makes it difficult for small children to fulfill their energy requirement, it considered a major factor in the development of malnutrition in areas where cereals and starchy staples are the main food. There are various way to reducing the viscosity of gruels, and among the low cost methods, sprouting seems to be most effective. During the sprouting of grains amylase activity is developed. These Amylase rich premixes can be used directly to address the twin problem of dietary bulk and poor energy density of most of the weaning gruels of the poor. These germinated cereal flour are extremely rich in enzyme alpha amylase this enzyme cleaves the long carbohydrates chains in the cereal flour into shorted dextrin. This remarkable property makes it possible to offer the child a low viscosity yet high energy dense preparation.

Ragi is nutritionally superior in comparison to cereals however its use nor popular in more then state due to lack of noble processing techniques. Considering the nutritionally superiority of Ragi for formulation of various king of infant foods. Ragi can be used in preparing amylase rich premixes by germinating technique at household level which can then be administered to children. Hence these premixes can be used directly to address the twin problem of dietary bulk and poor energy density of most of the weaning gruels of the poor. Hence an effort should now be geared to popularize this useful yet inexpensive technology. Keeping all the above discussed aspects in mind the present investigation was planned to develop amylase rich Ragi based premixes.

### MATERIALS AND METHODS

Ragi (GPU 67) samples were procured from the Agricultural research center of Tamil Nadu, procurement of the certified Mung bean (MSJ-118), Soya bean (NRC 37 Ahilya 4) seeds under experimentation was done from Durgapura Agricultural Research Centre, Jaipur. The test samples were initially cleaned manually the seeds were subjected to viability test by placing them in water, then soaked in distilled water for 12 hrs at 28°C (room temp) without direct contact with sun light. Samples were divided into three groups and germinated for: 24, 36 and 48 hr. and dried in sun. And then the grains were roasted rootlets were removed and then crushed. The dried grains were powdered to a fine flour to prepare s ARF. The composition of premix being: Ragi 50 gm (Millets), green gram whole 25 gm (pulse), soya bean 10 gm (oilseeds). Finally four different kind of Infant premixes were prepared Infant Premixes C (control) was prepared by using non-germinated seeds Infant premix I form 24 hours germinated samples, Infant premix II and III from 36 hrs and 48hrs germinated samples.

### Results:

Anti-Nutrients estimations of Ragi based (RMU) Infant premixes

Anti-Nutrient Estimations were carried out with the basic aim to evaluate effect of germination on anti-nutrient composition of the prepared premixes by using standard biochemical techniques. All the techniques which were used for estimations were first standardized. Oxalic acid content of control Infant premix was 25.63 mg per 100 g; in Infant premix I it was estimated to be 22.83 mg per 100 g but as the duration of germination was increased from 24 to 36& 48 hours the oxalic acid content gradually reduced. The phytic acid content of control premix was 102.33 mg per 100 g, however as duration of germination was increased the phytic acid content reduced to 82.83 mg per 100 g (Infant premix I); 49.89 mg per 100 g (Infant premix II); 38.65mg per 100g (Infant premix III) these findings are similar to results reported by Tizazu et al (2011); their research reported

the effects of germination on minerals bioavailability of sorghum based complimentary foods, which reported statically significantly reduction in phytic acid levels (m/100g) (p <0.05) for different varieties of sorghum as germination time was increased from 36 & 48 hrs. From this it can be concluded that long germination periods are sufficient to produce an appreciable reduction in the anti-nutrient contents and thus help in improving the utilization of available protein & carbohydrates as well as minerals. These anti nutrient has been reported to from complexes with protein which then become more resistant to proteolytic degradation ( Cheryan, 1980). Thus these anti-nutrient lowers the bioavailability of both minerals as well as proteins and germination is a household inexpensive technology which improves net availability of nutrients.

**Table 1: Anti-Nutrients estimations of Ragi Mung (RMU) based Infant premixes**

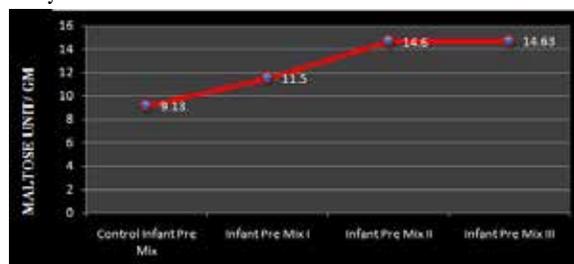
Sample code *	Oxalic	Phytate
Control Infant Premix	25.63± 13.55	102.33±2.51
Infant Premix I (Mg/100gm)	22.83±2.10	82.83±5.65
Infant Premix II(Mg/100gm)	13.86±1.95	49.89±0.89
Infant Premix III (Mg/100gm)	6.73±1.46	38.65±1.81

In the present study amylase activity in Control Infant Pre Mix was 9.13 maltose units per 100 g; but as the duration of sprouting was increased from amylase activity also increased. In Infant Pre Mix Its was estimated to be 14.76 maltose unit per 100 g Infant Pre Mix I was 11.5 maltose unit per 100 g., Infant Pre Mix II was 14.6 maltose unit per 100 g. and Infant Premix III was 14.63 maltose unit per 100g. Protease activity in Control Infant Pre Mix was 3.53 protease unit per 100m g; but as the duration of sprouting was increased from 24 to 48 hrs an enhancement was also reported in protease activity in Infant Pre Mix I Its was estimated to be 3.66 protease unit per 100 mg; Infant Pre Mix II was 3.76 Protease unit per 100 mg; and Food <Mix III was 3.93 protease unit per 100m g.

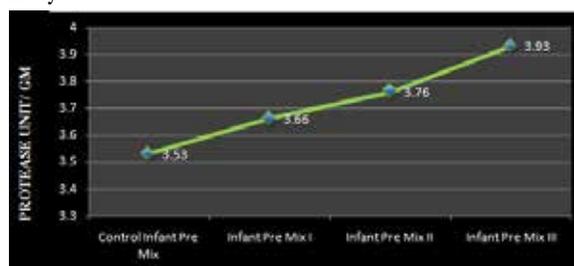
Ghavidel and Davoodi (2011) analyzed α amylase activity as a function of sprouting time, the non-sprouted samples legumes exhibited very low amylase activity which ranged from 7.0 to 18.1 maltose units/g dry matter. The α amylase activity improved by 10 to 150% over the initial value with the lowest in cowpea and highest in mung bean samples. Appreciable increase was observed in mungbean from 8.1 to 280.2 maltose unit/g dry matter at 0 to 72 h sprouting time followed by cowpea lentil and chickpea that had increases of exceeding 600, 500 and 200% respectively over the untreated initial values Uriyo in 2001 also reported that increase in amylase activity with increase in duration of sprouting of cowpea α- Amylase levels increased from 85.6 to 720.9 μmole maltose/ml of extract at 0 and 72 h sprouting time. Similar behavior was reported for cowpea by Malleshi et al (1989) whose investigation indicated that α amylase activ-

ity had attained a maximum at 3 days sprouting and had begun to decline at 4 days. Sumathi in 1995 also showed improvement in α amylase.(Helland et al, 2002); oats (Bodin, 1995); millet (Gimbi and Kitabatake, 2002)and sorghum (Lasekan ,1996 &Uvere et.al, 2000). According to research done by Ghavidel and Davoodi (2011) the results of soaking and sprouting studies on protease activity of legumes highlighted that the non-sprouting sample had 0.71 to 1.53 protease unit/g dry matter and the lowest and highest values were estimated to be of mung bean and chick pea respectively Soaking increased significantly (P<0.05) the protease activity of the legumes by 17-36% over the non-sproutingsamples. Chickpea had the highest protease activity at 72 h sprouting (6.21 protease unit/g dry matter) followed by lentil, cowpea and mung bean. Although, the maximum increase in enzyme activity at 72h sprouting over the initial values was in cowpea (310%), following by chickpea (306%), lentil (232%) and mungbean (216%). However, mung bean had 311% increases in enzyme activity in 48 h sprouting. Kikunage et al (1991) studied about the effect of sprouting on protease activity of chickpea and Mung bean which support these results so as the duration of sprouting was increased enzymatic activity also increased.

**Figure: 1 Impact of duration of Germination on amylase activity**



**Figure: 2 Impact of duration of Germination on protease activity**



**CONCLUSION** Germination helped in improving the nutritional value and enhances the net availability of nutrients due to enzymatic degradation of carbohydrate, protein & fats. Thus the resulting products in easily digestible and can be used as food for infant and young child feeding.As the duration of germination increased the enzymatic activity was enhanced resulting in breakdown of complex nutrients into simpler one which are easily digestible by infants.

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