Nuritional, Sensory and Physical Analysis of Processed Multi Grain Weaning Mix

Gayatree R. Jadeja

Assistant Professor, KrushiVigyan Kendra, AAU, Arnej - 382 230
Email : jadejagayatree@yahoo.com

ABSTRACT

The present study was on the development of weaning food based on wheat, chickpea and ragi and adapting the Malting, Germinating and Popping technology. The sensory was physico- chemical and nutritional quality of malted, germinated and popped and control weaning mix was carried out. The results suggest that the weaning foods based on wheat, chickpea and ragi are nutritionally balanced and possess good growth promotingpotentiality. The traditional technologies such as Malting, Germinating and Popping of cereals and legumes could be easily adapted to prepare weaning and supplementary foods from wheat, chickpea and ragi. Malting, Germinating and Popping have a high potential for developing low cost weaning and supplementary foods.

Keywords: *Weaning mix, Nutritional quality*

INTRODUCTION

Having a baby at home is a wonderful experience. Looking after the baby and caring for it is an even more fulfilling experience. There are several important stages in an infant's growth. But one of the most important aspect, and often misunderstood stage is the weaning. The introduction to solid feeding and the gradual replacement of breast milk by solid food as the main source of nutrition is the process known as weaning. Weaning is a period of transition for the infant during which the diet changes in terms of consistency and source(Usha et al., 2010). At six months, a baby's digestive system has matured enough to cope with solid food, and other developmental changes (such as the ability to bite and chew) means your baby is ready to experience new tastes and textures.

However, the capacity of a weaning diet to meet the protein and energy requirements of infants depends on its nutritional quality as well as its dietary bulk. This can be achieved through legume supplementation of cereal-based weaning foods. However, their role appears to be limited because of several factors including low protein and starch digestibility, poor mineral bioavailability and high anti-nutritional factors (Kamchan et al., 2004, Negi et al., 2001). It has been reported that protein and thiamin (Sattar et al., 1989, Savelkoul 1992) mineral bioavailability and protein and starch digestibility (Preet and Punia, 2000) increased, whereas phytic acid and tannin decreased during germination of legumes.

Legumes are known to contain lysine in a quantity that exceeds the requirements for human but with the low content of sulphur amino acids. Cereals, on the other hand, are high in the sulphur amino acids but deficient in lysine. A mutual complementation of amino acids and consequent improvement in protein quality is therefore achieved when legumes are blended with cereals in the right proportions. Cereals form the major part of most weaning mixes and contribute to 70-80% of daily energy intake(Mahajan andChattopadhey, 2000). Legumes are largely replacing milk and other sources of animal proteins, which are expensive and not readily available in India as suitable substitutes for high quality protein.

METHODOLOGY

Wheat, chickpea and ragi purchased from a local market (Anand, India) were cleaned and used for the studies. Three different processing techniques (Malting, Germination & Popping) used for the development of processed multi grain weaning mix.ForMaltingWheat, chickpea and ragi were soaked separately in water for overnight,drained water,sun dried, and milled into flour using grinding mill.

For GerminationWheat, Chickpea and Ragiwere soaked overnight in water separately, packed individually in wet muslin cloth for sprouting.After that all were sundried and milled into flour.For PoppingWheat, Chickpea and Ragi were roasted in dry sand individually at high temperature for short period of time andmilled into flour.

Development of Standard Product

"Nestle Cerelac Stage 1(6+months) Wheat"used as a control product. The experimental products include the addition of different proportion of cereals and pulses. That were treated for Malting, Germination and Popping and milled into flour.

Sr. No.	Ingredients	Control (g)	Experimental Weaning Mix			
			A Without Process (g)	B Malted (g)	C Germinated (g)	D Popped (g)
1	Nestle Cerelac	100	-	-	-	-
2	Wheat flour	-	25	25	25	25
3	Chickpea flour	-	10	10	10	10
4	Ragi flour	-	25	25	25	25
5	Skimmed Milk Powder	-	30	30	30	30
6	Crystal sugar powder	-	10	10	10	10

For testinginstant weaning mix powderswere mixed into lukewarm water with proper and continuous stirring until homogeneous mixture obtained.

For sensory evaluation, score cardoftwo different sensory tests i.e. Numerical scoring test and Hedonic rating testwere used. All the weaning mix products were evaluated for Visual Attributes (i.e. Color, Appearance, Consistency and Texture), Organolaptic Attributes (i.e. Stickiness, Easy of swallowing, Aroma, Taste, After Taste, Chewability and Overall Acceptability) using following scales; Excellent (9-10); Very good (7-8); Good (5-6); Fair (3-4); and Poor (1-2). The different products were ranked for individual quality attributes and also to score Overall Acceptability on a 10 point scale by 10 panal members.

Both control as well as experimental products were undergone for nutrient analysis using standard methods. Fat and ash by AOAC (1984), nitrogen by Khjeldhal (1883), carbohydrate by Anthrone (Hedge and Hofreiter, 1962). The samples were ashed in a muffle furnace and solution was prepared. The solution used to estimate Iron using colorimetricallyDipyridyl method (Ramsay, 1954), Calcium usingtitrimetric method (Clark and Collip, 1925), Phosphorus by colorimetric method (Fiske and Subbarow, 1925). Insoluble and soluble dietary fibre was estimated by AOAC method. Zinc was determined by titrimetric method (Jeffery et al., 1889).

Physicochemical property i.e. the Water Holding Capacity (WHC) of the samples were determined using the centrifuge technique of Gandhi and Srivastava(2007).

The analysis was carried out in triplicates for all determinations. The mean, standard deviation of means, standard error of means were calculated. A multiple comparison procedure of the means was performedusing the 'T' test. Significance of the differences was defined as $p<0.05$.

RESULTS AND DISCCUSION

Table 1 shows the Sensory Attributes of Control and experimental Weaning Mix. It revealed that "Germinated weaning mix" and "Popped weaning mix" were scored higher for most of all the characteristics compared to the non-processed and "Malted weaning mix" as well as the Control i.e. "Cerelac weaning mix".

In Visual attributes Appearance, Colour, Consistency, Texture and Aroma were included. For the appearance,texture and aroma attributes the germinated weaning mix shows significant difference ($p<0.05$) compared to the Cerelac.

In Organoleptic attributes the Taste, Chew ability, Easy of swallowing, After taste and Overall Acceptability were evaluated. For all the Organoleptic attributes the germinated weaning mix was significantly higher ($p<0.05$) compared to the control while the other experimental weaning mixs were scored less compared to the control. That means the germinated weaning mix found more acceptable even the commercially available mixes.

Table 1: Sensory score for control and experimental

weaning mix powder

Nutrients	Weaning Mix Food				
	Control	Experimental			
		A	B	C	D
Visual Attributes					
Appearance	8.222 ±0.364	7.111 ±0.351	7.388 ±0.161	8.888* ±0.138	8.500 ±0.220
Color	8.274 ±0.364	7.366 ±0.345	7.488 ±0.188	8.565* ±0.204	8.233 ±0.375
Consistency	8.166 ±0.383	7.500 ±0.275	7.286 ±0.135	8.666 ±0.243	8.482 ±0.165
Texture	8.388 ±0.245	7.488 ±0.284	7.445 ±0.205	8.375 ±0.185	8.825 ±0.168
Aroma	8.233 ±0.155	7.366 ±0.155	7.323 ±0.172	8.446* ±0.188	8.128 ±0.206
Organoleptic Attributes					
Taste	8.166 ±0.325	7.155 ±0.144	7.432 ±0.177	8.766* ±0.155	8.556 ±0.395
Chew ability	8.566 ±0.288	7.344 ±0.256	7.452 ±0.121	8.955* ±0.233	8.725 ±0.226
Easy of swallowing	8.144 ±0.375	7.322 ±0.353	7.322 ±0.182	8.433* ±0.452	8.115 ±0.255
After taste	8.166 ±0.325	7.185 ±0.286	7.452 ±0.225	8.588* ±0.118	8.495 ±0.144
Overall acceptability	8.166 ±0.305	7.333 ±0.322	7.522 ±0.311	8.875* ±0.166	8.556 ±0.220

Control :Cerelac Weaning Mix, A : Weaning Mix without processing B : Malted Weaning Mix,
C : Germinated Weaning Mix, D : Popped Weaning Mix

Mean of three replication ±SEM,Value sharing a common superscript within a control are not significant different
*p<0.05= significant difference**p<0.01=highly significant difference, NS = Non significant difference

Table 2 shows the selected nutrient contents and Water holding Capacity of Control and experimental weaning mixs. The calcium content was found the highest in the without process weaning mix and the lowest in the germinated weaning mix. Phosphorus value of all experimental weaning mixs was found lower as compared to the control. The Iron and Zinc contents of all the experimental weaning mixs were found higher compared to the control with highly significant difference ($p<0.01$).The Carbohydrate was found lower in all the experimental weaning mix compared to the control and they were significantly differ ($p<0.01$) too. Protein content was also found slightly higher compared to the Cerelac and the significant difference ($p<0.05$) was seen in the Malted and Popped weaning mix in comparison of Cerelac. The Water holding capacity of all the experimental weaning mix was lower compared to the control as it contained higher amount of carbohydrate.

Table 2: Nutrient Content of Control and Experimental Weaning Mix

Nutrients	Weaning Mix				
	Cerelac (Control)	Experimental			
		A	B	C	D
Ash (g%)	2.763 ±0.064	2.725 ±0.022	2.655 ±0.035	2.470 ±0.119	2.780 ±0.083
Calcium (mg%)	539.259 ±15.983	615.185** ±15.072	550.370 ±6.676	185.555** ±7.856	402.222** ±3.928
Phosphorus (mg%)	296.305 ±2.216	258.947** ±2.292	292.820* ±4.847	281.171* ±5.100	288.396* ±2.967
Iron (mg%)	14.590 ±0.794	27.360** ±1.431	29.970** ±0..670	28.906** ±0.605	33.801** ±0.618
Zinc (mg %)	0.553 ±0.009	1.315** ±0.008	1.466** ±0.009	1.358** ±0.008	0.956** ±0.003
Carbohydrate (g%)	96.000 ±0.333	54.888** ±0.888	63.555** ±0.376	63.555** ±0.376	70.888** ±0.200
Fat (g%)	4.666 ±0.666	4.666 ±0.421	5.333 ±0.421	3.666 ±0.333	7.333* ±0.421
Protein (g%)	13.883 ±0.583	18.433 ±0816	20.008* ±0.291	14.466 ±0.583	21.350* ±0.534
Crude fiber (g%)	0.753 ±0.003	1.703** ±0.003	1.996** ±0.016	1.860** ±0.03	1.833** ±0.016
Water Holding Capacity (g%)	1.822** ±0.022	0.611** ±0.030	0.866** ±0.072	0.944** ±0.024	0.955** ±0.024

Control :Cerelac Weaning Mix A : Weaning Mix without processing B : Malted Weaning Mix,
C : Germinated Weaning Mix D : Popped Weaning Mix

Mean of three replication ±SEM,Value sharing a common superscript within a control are not significant different, *p<0.05= significant difference,**p<0.01=highly significant difference,NS = Non significant difference.

CONCLUSION

Overall all the sensory attributes were found higher in the Germinated weaning mix. The other processed samples were also scored up to level on the acceptable.

After the sensory evaluation of the control and the experimental weaning mix, they were nutritionally analyzed. The Calcium was higher in without process weaning mix. The Phosphorous and Zinc were higher in the Malted weaning mix. Whereas the Iron, Carbohydrate, Fat and Protein were higher in the Popped weaning mix. The Crude Fiber was found higher in the all the experimental weaning mix compared of the control sample.

In Conclusion of the study our results suggest that the weaning foods based on wheat, chickpea and ragi are nutritionally balanced hence they may possess good growth promoting quality. The Germinating of cereals and legumes could be easily adapted to prepared weaning and supplementary foods from wheat, chickpea and ragi. Since better quality mix could be produced even control. Thus it has high potential for developing low cost weaning and supplementaryfoods.

REFRENCES

AOAC (1984), "Official Method of Analysis" 14th Edn. Associationn of official analytical chemists, Washington DC.

Clark F. P. and Collip J. B, (1925),"Determination of calcium by titremetric method", *journal of biological chemistry,* 63,461.

Fiske C. H. and Subbarow (1925),"Colorimetric Determination of phosphorus", *journal of biological chemistry*, 66 : 375-400.

Gandhi, A.P. and Srivastava, T. (2007), "Studies on the production of protein isolates from defatted sesame seed (Sesamumindicum) flour and their nutritional profile, *Asian Food Journal,* 14(3), 175-180.

Hedge, J.E. and Hefreiter, B.T. (1962), "Methods in carbohydrate chemistry", Vol. 17 (Eds.), Whistler R.L. and BeMiller, J.N., Academic Press, New York, p.420.

Jaffery G. H., Bassett J., Mendham J.(1989),"Vogel's quantitative analysis of chemicals", *Hangman Harlow.*, 5 : 284-294.

Kamchan A., Puwastien P., Sirichakwal P.P. and Kongkachuichai R.(2004),''In vitro calcium bioavilability of vegetables, legumes and seeds'', *J. Food Composition and Analysis*., 17 : 311-32.

Kjeldahl, J. (1883), New method for the determination of nitrogen in organic substances, Zeitschrift fur analytischechemie, 22(1): 366-383.

Mahajan P.V. and Chattopadhey P.K.(2000),''Development of chemically leavened cereal legume based instant mix (dhokla)'',*J Food Technol.,* 37 : 459-464.

Negi A., Boora P. and Khetarpaul N.(2001),''Starch and protein digestibility of newly released moth bean cultivars: Effect of soaking, dehulling, germination and pressure cooking'',Nahrung., 45(4) : 251-254.

Preet K., Punia D.(2000), ''Antinutrients and digestibility (in vitro) of soaked, dehulled and germinated cowpeas'', *Nutr. Health*.,14(2) : 109-117.

Ramsay W. N. M.(1969),''Method of iron estimation'', *journal of biological chemistry,17,* Practical clinical biochemistry – 4th edition.

Sattar A., Durrani S.K., Mahmood F., Ahnad A. and Khan I.(1989), ''Effect of soaking and germination temperatures on selected nutrients and antinutrients of mung bean'', *Food Chem*., 34 : 111-120.

Savelkoul F.H.M.G., Vanderpeol A.F.B. and Tamminga S.(1992),''The presence and inactivation of trypsin inhibitors, tannins, lectins and amylase inhibitors in legume seeds during germination. A review'', *Plant Foods for Human Nut.*, 42 : 71-85.

Usha R., Lakshni M. and Ranjani M.(2010), '' Nutritional, Sensory and Physical Analysis of Pumpkin Flour Incorporated into Weaning Mix'', *Mal J Nutr.,* 16(3) : 379-387

Received : April 2014 : Accepted : December 2014