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Research Paper

Development and quality evaluation of instant iron rich weaning mix

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■ **ABSTRACT :** The present study aimed to prepare a weaning mix using malted pearl millet and malted wheat. To find out the acceptability of weaning mix sensory evaluation was done. The acceptability scores ranged between 7 to 8 for different sensory characteristics. Bulk density, wettability, water absorption capacity, swelling capacity, solubility was found to be 0.62 g/ ml, 14.33 seconds, 60%, 4 g per cent, 19.66, respectively. Proximate composition of weaning mix revealed 3.01 g/100 g, 11.66g/100 g, 2.51 g/100g, 2.51 g/100g, 0.41g/ 100g, 79.06 g/100g and 392 Kcal/100g for moisture, protein, fat, ash, fibre, carbohydrate and energy, respectively. Total iron content was found to be 6.93 mg/100 g and bio available iron was 5.66 mg/100 g. The per cent availability of iron was found 81.67 per cent. Phytic acid content was found to be 39.84 mg/100g while Vitamin C content of weaning mix was 11.77 mg/100g. The microbial count was also found in safer limit less than 50,000 per g of sample according to Indian Standard Value safe for consumption. Peroxide value was also found in safe limit no rancid taste was found during organoleptic evaluation of weaning mix at 0^{th} day and 30^{th} day of storage.

■ **KEY WORDS :** Quality evaluation, Iron, Weaning mix

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Infancy is the crucial stage of life span. Adequate nutrients are required for proper growth and development. Breast milk is good for babies because it contains Colostrum which contains antibodies like immunoglobulin A that helps defend the child from diseases and infections in addition to its high nutritive values (Davidson, 2004). Some mothers stop breast feeding their children at very early ages without appropriate quantity and quality of weaning food. This can result to malnutrition and its attendant consequences. The main concern is making sure that there is no gap between nutrient requirements and what a child is able to consume, absorb and utilize. This nutrient requirement can be fulfilled through weaning.

Pearl millet and wheat can be a better option to prepare low cost and nutrient rich weaning mix. Pearl millet (*Pennisetum glaucum*) which is also known as *Bajra*, contains various essential micro nutrients needed by the body. It is rich in B-vitamins, potassium, phosphorous, magnesium, iron, zinc, copper and manganese. Pearl millet contains high amount of iron (8mg/100g) and zinc (3.1mg/ 100g), (NIN, 2011). Wheat (*Triticum aestivum*) is a cereal grain, contains, calcium, magnesium, sodium, potassium, chlorine, sulphur, silicon, zinc, manganese, cobalt, copper, iodide, arsenic, vitamins A, B, E, K and D. Thus, wheat is the base for nourishment (FAO, 2009). Pearl millet and wheat are the major staple crops of India but still these are hard to digest in infant gut. Processing techniques are known to improve the nutritional status of weaning food by decreasing anti-nutritional components in food. Some processing techniques like popping, soaking, germination, malting, fermentation are required to enhance the digestibility. Germination, roasting and malting of grains are traditional processing methods widely practiced in various parts of our country. These practices not only shorten the cooking time but also increase the digestibility and nutritive value (Sadana *et al.*, 2004). For increasing the absorption of iron addition of ascorbic acid is the best way because ascorbic acid is a potent

enhancer of non-heam iron absorption that can overcome the inhibiting effect of phytic acid when present in enough quantities.

■ RESEARCH METHODS

For the preparation of weaning mix wheat, pearl millet, sugar and milk powder were procured in a single lot from the local market of Udaipur. Pure ascorbic acid of Chemistry Limited lab was purchased from local market. Wheat and pearl millet were malted by standard method suggested by Gupta *et al.* (1990). Malted grains were converted to flour. Combination of (malted pearl millet flour + malted wheat flour) along with milk powder, sugar and ascorbic acid in different combinations were used for product development. Weaning mix in different ratio (Table A) was then reconstituted by boiling water and cooking time, cooked weight and cooked volume was recorded. A panel of ten judges was selected on the basis of threshold test as suggested by (Griswold, 1962) and scores cards were developed. Nine point hedonic scale (Williams, 1989) was used for sensory evaluation of prepared weaning mix. Cost of weaning mix was also calculated. Physical characteristics like bulk density (Singh *et al.*, 2005), wettability (Okezie and Bello, 1988), water absorption capacity (Sosulski *et al.*, 1976.), swelling capacity (Ukpabi and Ndimele, 1990), solubility (Leach *et al.*, 1959) were determined. Proximate composition of weaning mix was determined by described method of NIN, (2003). Iron and phytic acid were calculated using method compiled by Jain and Mogra (2006). Vitamin C content of weaning mix was determined by NIN (2003). One month shelf-life examination was also done, peroxide value (Nielson, 2010), microbial count (APHA, 1984) and sensory evaluation was also examined to check the keeping quality of weaning mix up to one month.

Table A: Different ratios for preparing weaning mix

Combination	Ratios				
	R1	R2	R3	R4	R5
Malted pearl millet+ malted wheat	1:1	1:2	2:1	4:5	5:4

■ RESEARCH FINDINGS AND DISCUSSION

For the development of the malted weaning mix, different combinations were tried. The scores for different ratios for overall acceptability ranged from 4.6 to 8.7 for R1, R2, R3, R4 and R5 (Table 1). In R1 ratio of weaning mixes the taste of wheat and pearl millet was dominated which reduced the flavour of milk powder hence it was unacceptable by the panel members. In R2 ratio of weaning mixes was unacceptable as the taste was not good. Dominating taste of pearl millet was found in R3 ratio of weaning mixes, which made it of unacceptable. Lumps were formed in R4 ratio which reduced the acceptability by panel members. R5 ratio of weaning mix was found most acceptable by panel members because of their pleasant aroma, flavour, smooth texture and very good taste and overall acceptability (Table 1).

Hence, R5 was finally selected for standardization of weaning mix with ascorbic acid. Different amount (5mg, 10 mg, 15 mg and 20 mg) of ascorbic acid was added to the mix and was evaluated organolepticaly. Results revealed that the mixes with 15-20 mg of ascorbic acid were acceptable by the panel members. The requirement of ascorbic acid for an infant

Table 1 : Sensory scores of weaning mixes (Mean± SE)

Ratios	Colour	Flavour	Texture	Consistency	Taste	Aroma	Overall acceptability
R1	4.6±0.69	4.8±0.78	4.9±0.73	4.6±0.51	4.2±0.63	4.6±0.69	5.4±0.51
R2	5±0.66	4.8±0.63	5.1±0.73	5.6±0.51	5.7±0.48	5.1±0.73	4.6±0.51
R3	4.7±0.67	5.1±0.87	5.33±0.95	5.3±0.82	5.2±0.78	4.6±0.69	5.1±0.73
R4	7.6±0.51	7.4±0.51	7.5±0.52	7.4±0.51	7.6±0.51	7.6±0.51	7.6±0.51
R5	8.3±0.48	8.5±0.52	8.3±.48	8.6±0.51	8.3±0.82	8.5±0.52	8.7±0.48

Table 2 : Standardized recipe of weaning mix

Ingredients	Amount (g)	Method
Water	125 ml	Water boiled
Malted wheat	8	Different powder were mixed and cooked till the mixture is prepared.
Malted pearl millet	10	
Sugar	18	
Milk powder	10	
Ascorbic acid	13 (mg)	Ascorbic acid was added in mix, stirred well and served hot.

Table 3 : Proximate composition of weaning mix (Mean±SE)

Moisture (g/100g)	Crude protein (g/100g)	Fat (g/100g)	Ash (g/100g)	Crude fibre (g/100g)	Carbohydrate (g/100g)	Energy (Kcal/100g)
3.01±0.30	11.66±0.62	3.33±1.15	2.51±0.38	0.41±0.04	79.06±1.57	392.90±6.02

is 25 mg (NIN, 2011) which can be fulfilled in two serving in a day. Hence, 13 mg of ascorbic acid was added to the mixes. Sensory scores were found 7.9, 8.03, 8.03, 8, 8.28, 8.06 and 8.21 for colour, flavour, texture, consistency, taste, aroma and overall acceptability, respectively after addition of ascorbic acid.

After reconstitution (Table 2) of weaning mix cooked weight, cooked volume and cooking time was found 175 g, 125 ml and 2.45 minutes, respectively. Cost of one serving was Rs.5.02/46 g. Bulk density was found to be 0.62 g/ ml, wettability was 14.33 seconds, water absorption capacity was 60 per cent, swelling capacity was 4 g per cent, solubility per cent was found to be 19.66. Proximate composition of weaning mix revealed that it contained moisture (3.01 g/100 g), protein (11.66g/100 g), fat (3.33 g/100g), ash (2.51 g/ 100g), fibre (0.41g/100g), carbohydrate (79.06 g/100g) and energy (392Kcal/100g) (Table 3). Total iron content was found to be 6.93 mg/100 g with 5.66 mg/100 g bio available iron and 81.67 per cent availability. Phytic acid content was found to be 39.84 mg/100g while vitamin C content of weaning mix was 11.77 mg/100g.

At 0^{th} day total viable count was found 36,333 cfu/g. Indian Standard values (1973) reported as upper limit of 50,000 colonies per gram of sample, colonies count was in the safe limit. After one month of storage TVC was found to be nil it may be due to the packaging of the weaning mix in HDPE polythene, is stronger, thicker and less flexible. Because of these properties there was a shortage of air, due to this reason bacterial growth retarded. Developed weaning mix was microbiologically safe for infants. Yeast and mould count was found to be nil at 0^{th} day and 30^{th} day of storage. Peroxide value of weaning mix was 1.67 and 2.77 meq/kg at 0^{th} day and 30^{th} day of storage. According to (www. medlabs. com), PV of greater than 5 should not be used in the manufacture of mix products, as it will significantly decrease the shelf-life of the product.

Conclusion:

It can be concluded that pearl millet can be used for the malting purpose and weaning mix can be prepared with malted technique which will be suitable for infant. This mix is nutrient dense and can be given in increased amount to the infants due to its low bulk density. The prepared mix was found to be iron rich and the bio availability of iron was also high. Due to good acceptance score, it can be consumed by infants. Weaning mix can be stored in air tight container for one month. It can be reconstituted whenever required. It is easy to prepare and easy to store and suitable for growing infant. This mix is not only low cost but also nutritious and easy to prepare at home.

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