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Surabhi Chauhan

M.Tech. Student, Department of Food and Biotechnology, Faculty of Agriculture and Veterinary Science, Jayoti Vidyapeeth Women's University, Jaipur, Rajasthan, India

Pallavi Singh

Assistant Professor, Department of Food and Biotechnology, Faculty of Agriculture and Veterinary Science, Jayoti Vidyapeeth Women's University, Jaipur, Rajasthan, India

Shilvi Biswas

M.Tech. Student, Department of Food and Biotechnology, Faculty of Agriculture and Veterinary Science, Jayoti Vidyapeeth Women's University, Jaipur, Rajasthan, India

Correspondence

Surabhi Chauhan

M.Tech. Student, Department of Food and Biotechnology, Faculty of Agriculture and Veterinary Science, Jayoti Vidyapeeth Women's University, Jaipur, Rajasthan, India

Development and sensory evaluation of nutritionally enriched instant weaning food based on indigenous food processing methods

Surabhi Chauhan, Pallavi Singh and Shilvi Biswas

Abstract

Most of the Infants from the rural areas in our country are suffering from malnutrition, the main reason behind their suffering is illiteracy among parents and also the high cost of the nutritional nourishments made for children having age of more than 6 months at commercial level. There are many locally available food materials that can be processed locally to prepare a suitable weaning food for infants which can fulfill their needs for nutrition. By taking into consideration above details, the main objective of this study was to develop suitable weaning food for infants with the help of locally available food material which is economical and having good nutritional composition. The product was developed into 4 different treatments with different combination of wheat flour, carrot flour, potato flour, sesame seeds flour and soya bean flour. T1(35% Wheat Flour, 10% Carrot Flour, 20% Potato Flour, 10% Sesame seeds Flour and 25% Soya bean Flour), T2 (40% Wheat Flour, 10% Carrot Flour, 20% Potato Flour, 10% Sesame seeds Flour and 20% Soya bean Flour), T3 (45% Wheat Flour, 10% Carrot Flour, 15% Potato Flour, 10% Sesame seeds Flour and 20% Soya bean Flour) and T4(50% Wheat Flour, 10% Carrot Flour, 15% Potato Flour, 10% Sesame seeds Flour and 15% Soya bean Flour). The different formulations of product were subjected to organoleptic analysis by the help of hedonic scale test and cost of all different treatments were calculated according to market price of raw material utilized. The organoleptic analysis scores were evaluated which described that according to the sensory score, T3 were more liked by the panels followed by T4, T2 and T1. The cost of the prepared weaning food was around Rs 8.2 –10 (T1 Rs 10, T2 Rs 9.1, T3 Rs 9 and T4 Rs 8.2). The development of this product was an effort for fulfilling the needs for nutrition in children from the rural areas so that they can get more nutritious supplement also cost effective product for low income families.

Keywords: Malnutrition, weaning food, wheat, carrot, soya beans, potato, sesame seeds

Introduction

Child malnutrition has always been the most leading public health problem in many developing countries. Worldwide, there were 99 million underweight, 165 million stunted and 51 million wasting children by the year 2012. It nearly kills 3.1 million children who are under the age of five (Black *et al*, 2013) [2]. For example, children who lack the nutrition level in their body appear to be at significantly greater risk of diarrhoea, with both greater frequency and augmented severity reported in malnourished infants (Guerrant *et al*, 1992) [6].

Weaning period is very essential phase in an infant development period, which if not done correctly, can lead to lack of nutrition's and other problems at the time of early age. While the introduction of weaning food, there can be various effects from timing, such as initial or late weaning, This procedure is also has unlimited geographic and ethnic variations (Luwang, 1985). Infants suffer from malnutrition majorly due to the carelessness of mothers/ women's from rural area are careless regarding weaning food and nutritional requirement of the growing children, also lack of knowledge over the available source of crops which are nutritionally rich. Thus, this attempt was made for spreading awareness of food and dietary requirement of the growing infants, low cost and nutritionally rich weaning mix was prepared from the food crops which are locally available also protein and vitamin A access is increased which results in providing rich food to the infants those who need nutrition rich food of families which have low or medium income of backward areas (Singh and Srinath, 2013) [18]. Home-made prepared weaning nourishments can be handled by utilizing oats, pulses, nuts and jaggery using milk or water. Handled nourishments like pasta, toasts and treats can likewise be given.

pre-digested yet is costly. Monetarily accessible weaning nourishments like vegetable soups, puddings, natural product, pastries, vegetable squeezes and organic product juices can be given

as a component of weaning sustenance (Srilakshmi, 2015) [19]. Potato is a very rich source of carbohydrate, resistant starch and dietary fiber keeps on being the staple food of decision for many societies (Camire *et al*, 2009) [3]. Preparing a potato into flour is the most meaningful strategy for making an item which isn't just satisfactory and a concentrated wellspring of potato, yet in addition stays for longer period with any harm to the material. The storage life is increased by the processing of the potato into flour, which automatically solves the problem of storage and furthermore, fills in as a way to expand the supply of potatoes in various structures, throughout the entire year, in a financially effective way (Marwaha, 1997) [11].

Carrot is a root vegetable which is basically rich in vitamins, carotenoids, flavonoids, polyacetylenes, and minerals, all of which have various nourishing and medical advantages (Dias and J.S., 2012) [4]. The powdered form of carrot is a concentrated form which leads to the formation of more value concentrated product which can be a great source of nutrition's for the infants (Babic, 1993) [1].

Soy protein is an important part of the eating habits of food producing animals and is progressively important in the human eating routine (Friedman and Brandon, 2001) [5]. Soy protein gives the some quality protein as meat, eggs and milk. Frequently with less soaked fat & bad cholesterol. At the point when picked instead of animal based proteins, soy offers other well-being preferences too (Bolla, 2015) [9].

Wheat is viewed as great source of protein, minerals, dietary fiber and B-bunch nutrients for example it's great health building nourishment. Consequently, it has turned into the vital grain, being all the more broadly utilized for the preparation of bread than some other grain because of the quality and amount of its main characteristic protein called gluten (Kumar *et al*, 2010) [10]. The measure of amylose, around 23%, and amylopectin, generally 77%, are present in wheat (Hegenbart, 1996) [7]. Wheat consist of nearly 20% of the food calories and 55% of carbohydrate. It carries protein around 14.70%, and fat 2.10 % (Shewry, 2007) [16].

Sesame seeds are known for its properties of good health which consists of proteins, nutrients, carbohydrates, lignans, antioxidants, tocopherols and other micronutrients (Prasad *et al*, 2012) [12]. Reports demonstrated that sesame-based integral meals had altogether expanded dietary benefits and it is consequently suggested for weaning and functional food formulation. (Lalude and Fashakin, 2006) [10] (Ogungbenle and Onoge, 2014) [15] (Onabanjo *et al.*, 2009) (Shuaibu *et al.*, 2015) [17].

The combination of these 5 value raw materials are combined by keeping in mind their good health properties which leads to a preparation of a very healthy weaning food for the best growth of the child. These raw materials are very rich in nutrients (Vitamins and Minerals) which fulfil the needs of a human infant to grow well.

Objective

1. To develop the weaning food by using indigenous food processing methods and locally available raw food ingredients.
2. To assess the sensory attributes and cost of the developed weaning food.

Materials and Methods

Experimental Site: The processing of the raw material and development of weaning food was done at Food and Nutrition

laboratory at the Department of Food and Biotechnology, Jayoti Vidyapeeth Women's University, Jaipur, Rajasthan.

Raw materials: All the raw material like Wheat, potato, carrot, sesame seeds and soya beans were purchased from the local market of Jaipur.

Preparation of Flours: All the raw materials were processed into a powder form for getting the more concentrated form of the selected raw materials. And to develop a ready-to-eat weaning food which can be consumed just by blending it with milk or water.

Preparation of potato and carrot flour

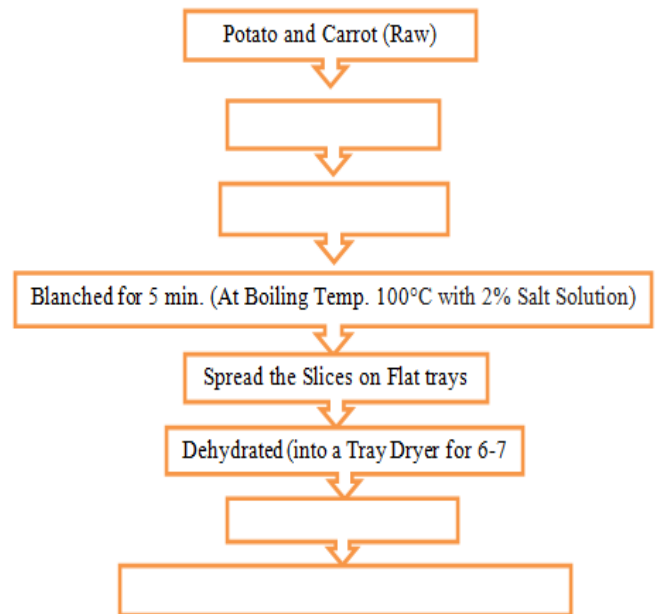


Fig 1: Flow chart showing the preparation of Potato and Carrot flour [Srivastava and Kumar (2007)]

Preparation of sesame seeds flour

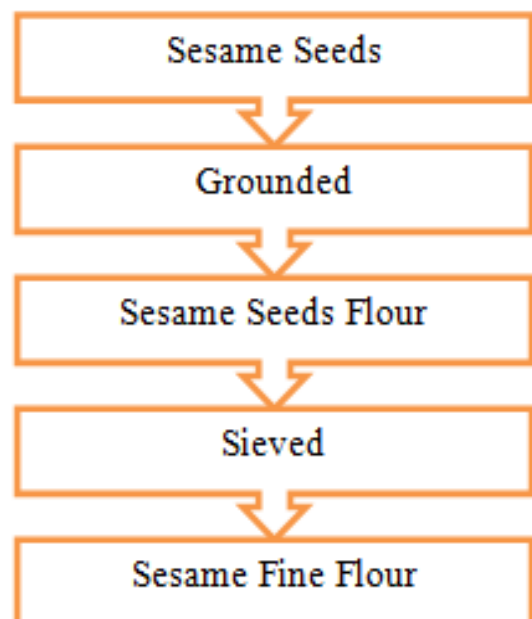


Fig 2: Flow chart showing the preparation of Sesame Seeds Flour [Srivastava and Kumar (2007)]

Preparation of wheat and soya bean flour

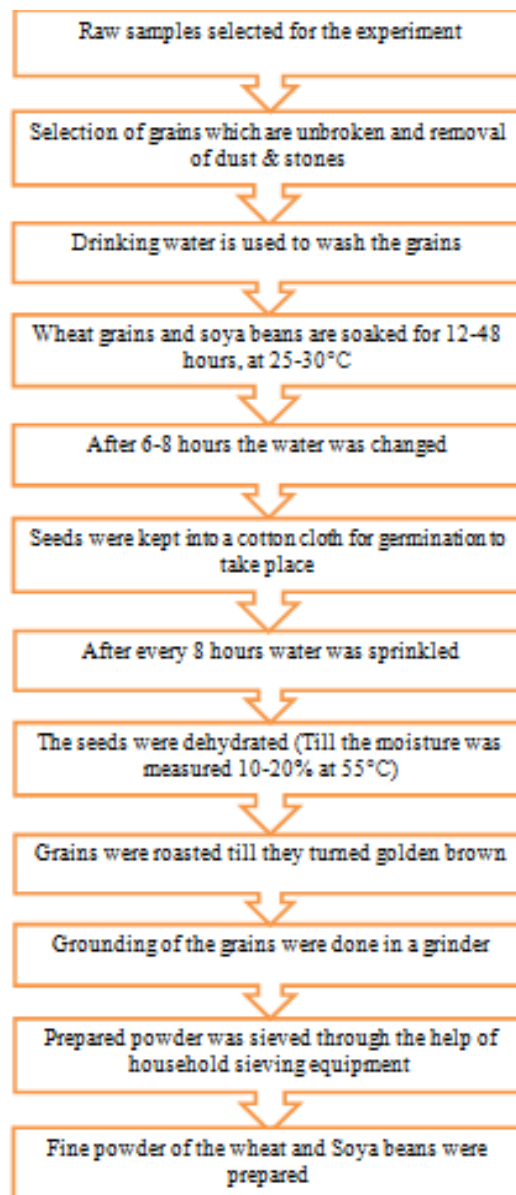


Fig 3: Flow chart showing the preparation of Wheat and Soya bean flours [Srivastava and Kumar (2007)]

Preparation of weaning food

Weaning food powder was prepared by combining all the flour of selected ingredients (Potato, Carrot, Wheat, soya beans and sesame seeds) in different proportions and reconstituted with water/milk with some jaggery as a

sweetener separately for sensory acceptability. 100 g of weaning powder was dissolved in 45 ml of lukewarm water/milk and 50 g jaggery was added to make it more acceptable for sensory evaluation.

Table 1: Treatments and replications of the product

Treatments	Whole wheat flour (%)	Sesame Flour (%)	Soya bean flour (%)	Potato flour (%)	Carrot flour (%)
T1	35	10	25	20	10
T2	40	10	20	20	10
T3	45	10	20	15	10
T4	50	10	15	15	10

Sensory acceptability of prepared weaning powder

Prepared weaning food was evaluated by a panel of five judges and they were asked to rate the different sensory attributes (colour, taste and flavour, consistency and overall acceptability) of the developed product by giving a score.

Cost calculation of the prepared weaning powder

The cost of the product was calculated on the basis of

prevailing market price of raw ingredients at rupees per 100 g.

Statistical Analysis

Statistical analysis of data was calculated by using the analysis of variance (ANOVA) Mean and Standard Error (Gupta and Kapoor 2002).

Result and Discussion

Table 2: The average sensory scores of prepared weaning food with Milk-

Treatments	Colour & Appearance	Consistency	Taste & Flavour	After Taste	Overall Acceptability
T1	7.2±0.37	7.2±0.40	6.5±0.5	6.8±0.37	7.0±0.31
T2	7.4±0.24	7.3±0.37	6.8±0.58	7.3±0.2	7.4±0.24
T3	8.2±0.2	7.6±0.48	7.9±0.33	8.1±0.45	8.4±0.24
T4	7.4±0.24	7.0±0.31	7.2±0.48	7.7±0.3	7.6±0.24
F%	23.65	7.24	37.39	53.89	15.39

In the above table 2 shows the average scores of prepared weaning food in the attribute of colour and appearance T3 (8.2) had the highest score followed by T4 (7.4), T2 (7.4), and T1 (7.2) respectively. So as in the attribute of consistency the average scores of weaning food tells that T3 (7.6) had the highest score followed by T2 (7.3), T1(7.2), and T4 (7.0). In taste and flavour the average scores of weaning food tells that T3(7.9) had the highest score followed by T4(7.2), T2(6.8), and T1(6.5) respectively. In the attribute of after taste the average scores shows that T3(8.1) had the highest score followed by T4(7.7), T2(7.3), and T1(6.8). The overall

acceptability mean scores shows that T3(8.4) had the highest score followed by T4(7.6), T2(7.4), and T1(7.0) respectively. There was a significant difference between the treatments at 5% probability level. The calculated value of F is greater than the tabulated value of F at 5% probability level. Therefore, it can be concluded that there was significant difference between treatments of weaning food regarding the various sensory attributes (color and appearance, taste and flavor, consistency and over all acceptability). Nazni and Suresh Kumar (2011) [8] and Srivastava *et al.*, (2016) [20] reported the same findings in their work

Table 3: The average Sensory Scores of Prepared Weaning Food with Water

Treatments	Colour & Appearance	Consistency	Taste & Flavour	After Taste	Overall Acceptability
T1	7.6±0.24	7.6±0.4	7.1±0.24	7.0±0.35	7.1±0.4
T2	7.4±0.24	7.8±0.48	7.2±0.25	6.9±0.33	7.2±0.25
T3	7.7±0.12	7.4±0.29	7.7±0.3	7.1±0.33	7.6±0.4
T4	7.4±0.4	6.8±0.2	7.8±0.37	7.4±0.24	7.3±0.37
F%	2.74	2.31	4.20	5.70	1.97

Table 3 shows the average sensory scores of prepared weaning food with water which revealed that in context with colour and appearance treatment T3 (7.7) had the highest score followed by T1 (7.6), T2 (7.4), and T4(7.4) respectively while in context with consistency of weaning food treatment T3 (7.4) had the highest score followed by T2 (7.8), T1(7.6), and T4 (6.8) respectively. In taste and flavour, the average scores of weaning food shows that treatmentT4(7.8) had the highest score followed by T3(7.7), T2(7.2), and T1(7.1) respectively and average sensory score of weaning food regarding after taste shows that T4(7.4) had the highest score followed by T3(7.1), T1(7.0), and T2 (6.9) respectively. The overall acceptability mean scores tells that T3 (7.6) had the highest score followed by T4(7.3), T2(7.2), and T1(7.1) respectively.

There was a significant difference between the treatments at 5% probability level. The calculated value of F is greater than the tabulated value of F at 5% probability level. Therefore, it can be concluded that there was significant difference between treatments of weaning food regarding the various sensory attributes (color and appearance, taste and flavor, consistency and over all acceptability). NeeruBala *et al.*, (2014) [14] and Srivastava *et al.*, (2018) reported the same findings in their work

Table 4: The average Cost of Prepared Weaning Food according to Market Price of Raw Material in Rupee/100 g

Treatments	Cost/100 g
T ₁	Rs 10
T ₂	Rs 9.1
T ₃	Rs 9.0
T ₄	Rs 8.2

The cost of all the raw material was calculated on the basis of the current cost of the materials we used in the local market. The calculation result indicates that the cost of Treatment 4

was lowest as compared to T1, T2 and T3 as shown in the above Table 4 So, the cost of the prepared weaning food was very less as compared to the weaning foods available at the commercial levels.

Conclusion

The prepared weaning food was made with the help of simple processing methods using locally available raw materials which were described as a good source of energy, protein, nutrition's etc, which makes it a beneficial food product for infants of age 6 to 12 months. The raw materials used to make the product were also very cost efficient as they are easily available in the local market at very less price. The study described that the children from the rural areas are more likely to suffer from malnutrition which is because of the illiteracy in rural areas and the high cost weaning products in the market. This prepared weaning food is a great nutritious supplement for children to consume, and the sensory attributes explains that it is also acceptable in taste and flavour along with other attributes. The cost calculation also concluded that the cost of the prepared weaning food was very less as compare to the weaning foods of commercial levels. So, this weaning product, which is cost efficient and also rich in nutrition's, is very beneficial for every infant for their development.

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