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UTILIZATION OF PSEUDOCEREALS INTO NUTRITIOUS PANCAKE PREMIX

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ABSTRACT

The food industry has introduced healthy foods as a result of the current health consciousness. People today demand nutrient-rich foods with enough health benefits in order to meet their health demands. In this study, the development and standardization of a wholesome pancake premix with pseudocereals was carried out. Healthy Pancake premix was packed in laminates and polypropylene under ambient conditions and analyzed for physico-chemical characteristic i.e. (bulk density, tapped density, crude protein and ash content) for period of 21 days. Among the four treatments the highest bulk density (0.56 g/cm³) in C1 (55::BWF), tapped density (0.71 g/cm³) in C1(55::BWF), crude protein content (11.56 %) in C2(55::BWF) and ash content in T2 (30:15:10BWF:AF:FF) was found during storage period. Thus, in general there was decrease in bulk density, tapped density, crude protein and ash content throughout the storage period of 21 days.
Keywords: premix, pancake, period, days, health, storage

Introduction

Ready-to-eat foods need not involve any further cooking and are typically stored in the refrigerator or at room temperature. Ready-to-eat foods offer the advantages of convenience, health, and variety (Muktawat and Varma, 2013). Premix is a term used to describe a substance that is mixed at the beginning of the process of production and distribution. Pancakes can be easily made from the premix by incorporating the required amount of fat or butter and water. Pancakes made from various instant mixes are consumed around the world under various geographical designations and have been shown to be among the most widely consumed wheat-based breakfast snacks. On conventional wheat pancakes, extensive research has been conducted on the processing conditions to improve texture and flavour (Yemmi Redddy *et al.,* 2013). Cereals are an essential staple in almost every country and serves a significant part in human nutrition. Rice, maize, and wheat are the three most widely grown cereal species, but millet, sorghum, oat, and barley are also important cereals, as are the pseudocereals amaranth, quinoa, and buckwheat (Bender and Schonlechner, 2021).

Buckwheat is a perennial crop in the *Polygonaceae* family that has no relation to grains. It is a member of the buckwheat pseudo-cereal family, which shares characteristics with grains such as wheat, rice and barley (Gimenez-Bastida and Zielinski, 2015). It distinguishes itself from other grains due to its main structure difference and its capacity to adapt to rapid development in highly agricultural areas(Christa and Soral-Smietana, 2008). Buckwheat, species are mostly consumed as food. Buckwheat is grown in many countries and has traits such as significant economic value, ease of consumption, and versatility (Valenzuela and Smith, 2002; Gull and Birer, 2017). Buckwheat can be grown almost anywhere and in a variety of habitats because it has the ability to adapt to ecology (Yilmaz *et al.,* 2020). Buckwheat is recognized as a good food source that is nutrient- wise valuable due to its protein, lipid, dietary fibre, and mineral content, as well as its combination with other health-promoting components. As a result, it is gaining popularity as a possibility for functional food. Buckwheat's amino acid composition and nutritional content are superior to other grains; it is also one of the protein sources with high biological value (Wronkowska *et al.,* 2010; Zhang *et al.,* 2012; Multari *et al.,* 2016).

Amaranth is a major pseudocereal that is an ancient plant in the family (*Amaranthaceae*) that is thought to have originated in central and southern America. The amaranth seeds have been regarded as promising ingredients for the production of flour, starch, and protein due to their high starch, protein, and lipid content (Sangeeta and Grewal, 2018). Amaranth encompasses a higher protein content than most cereals, ranging from 12% to 18%, as well as a higher lysine content and a suitable amount of tryptophan and methionine, each of which are found in low concentrations in cereal and legume grains. It has a lipid composition of 10 to 17% and a high proportion of unsaturated fatty acids. It also contains a lot of vitamins and minerals (Sindhu and Khatkar, 2016).

Makhana (*Euryale ferox salisb*) is an aquatic crop and is commonly known as Gorgon nut or Foxnut. Being the non-cereal food, Makhana is an ideal staple food of devotees

during the religious fast. Makhana seeds are high in in magnesium, potassium and phosphorus and low in saturated fats, sodium and cholesterol. It contains proteins that is easily digestable, carbohydrates, total minerals, phosphorus and iron. These chemical constituents are extremely beneficial for human body and also provide rich source of nutrition. It is high in fibre and aids in constipation. Makhana can be stored in two forms i.e. seeds and popped makhana. Hence, popped makhana flour could be a useful alternative in development of nutritious food products (Kour *et al.,* 2022). There is a knowledge gap regarding the use of pseudocereals in the production of therapeutic foods and nutritious pancakes. As a result, this study was carried out for the preparation of healthy pancake premix, which is high in nutritive value and also contains beneficial components of buckwheat flour, amaranth flour, fox nut flour.

Materials and Methods

Selection of ingredients and preparation of pancake premix

Popped makhana was purchased from a nearby market and then grinded into a fine powder or flour before sieving. Buckwheat flour, amaranth flour, jaggery, milk powder, almond powder, and baking powder were also purchased from the local market. The ingredients (buck wheat flour, amaranth flour, makhana flour, jaggery, milk powder, almond powder, and baking powder) were precisely weighed. The pre-weighed ingredients were then stored at room temperature in polypropylene and laminates.

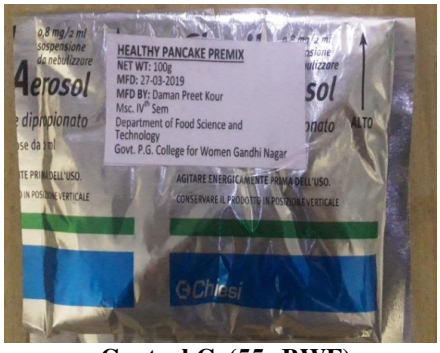
Methodology for preparation of pancake from premix

To develop a pancake from a premix, a measured amount of water (95 ml) was added to the batter and stirred for about two minutes with a wire whisk. It was important to avoid over mixing. Finally, the batter was poured onto the preheated griddle, and the pancakes were cooked for about 1.5 minutes at 190 ºC until the bubbles on the upper surface of the pancake were broken (as an indication of proper cooking), then turned and cooked for another 1.5 minutes at ambient temperature.

Table 1 : Treatment details for the preparation of healthy pancake premix per 100g.

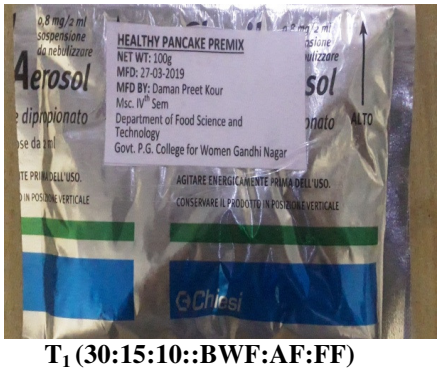
Treatment	Buckwheat Flour (%)	Amaranth Flour (%)	Makhana Flour (%)	Jaggery (%)	Almond Powder (%)	Baking Powder (%)	Milk Powder (%)
C_1	55	-	-	22	6	1	16
C_2	55	-	-	22	6	1	16
T_1	30	15	10	22	6	1	16
T_2	30	15	10	22	6	1	16

C_1 and T_1 = packed in laminates, C_2 and T_2 = packed in polypropylene
Number of treatments : 4 Number of replications : 3
Storage duration : 21days



Control C_1 (55::BWF)
Packed in Laminates

Control C_2 (55::BWF)
Packed in Polypropylene



T_1 (30:15:10::BWF:AF:FF)
Packed in Laminates

T_2 (30:15:10:BWF:AF:FF)
Packed in Polypropylene

Fig. 1 : Healthy pancake premix packed in laminates and polypropylene

Physical analysis

Bulk Density

Raw material weighing (5g) was put in measuring cylinder and the volume of the sample was noticed. Bulk density was measured as weight of sample per unit volume (Francis., 2018).

Formula used for calculating bulk density is:

$$\text{Bulk density} = \frac{w}{v}$$

Where,

W = weight of the sample taken in (g)

V = seed volume recorded after subtracting 500ml from the total volume

Tapped Density

Raw material weighing (5g) was put in measuring cylinder and then tapped 8-10 litres from a particular height. After tapping the change in volume of sample is measured (Francis, 2018).

Formula used for calculating tapped density is:

$$\text{Tapped Density} = \frac{\text{Weight of sample}}{\text{Volume of sample after tapping}}$$

Chemical analysis

Moisture

Moisture content was determined as per standard AOAC (2005) method by following the oven drying method as the loss in weight due to evaporation from sample at a temperature of 105±1 ºC till constant weight was achieved. The weight loss in each case represented the amount of moisture present in the sample.

$$\text{Moisture}(\%) = \frac{\text{Loss in weight}(g)}{\text{Weight of sample}(g)} \times 100$$

Crude fat

Crude fat was determined by the soxhlet extraction technique (AOAC, 2005). Fat content of the sample was easily extracted into organic solvent (petroleum ether) at 60 to 80 ºC and followed to reflux for 6 hours. After extraction the thimble was dried in hot air oven to a constant weight, cooled in desiccators and weighed. The loss in weight of thimble indicated the amount of fat in the sample

Crude protein

The crude protein content was determined by micro Kjeldahl method, using the factor 6.25 for converting nitrogen content into crude protein (Sadasivam and Manickam, 2008). Weighed sample of 2 g was digested with concentrated sulphuric acid (2ml) and 2 g of catalyst mixture (K_2SO_4, $CuSO_4$ and SeO_2) in long neck Kjeldahl flask for 2 hours till free from carbon. The contents were cooled and transferred to 100 ml volumetric flask and volume was made to 100 ml with distilled water. Measured aliquot was distilled with 40 per cent sodium hydroxide and liberated ammonia was collected through a condenser in a flask containing 10 ml (4%) boric acid solution and few drops of mixed methyl red and bromocresol green indicator was titrated against standardized 0.1 N sulphuric acid and crude protein content was calculated using the equation below. A blank sample was also run along with the sample.

$$\text{Nitrogen}(\%) = \frac{\text{Titre value} \times 0.00014 \times \text{Volume made}}{\text{Aliquot taken}(ml) \times \text{Weight of sample}(g)} \times 100$$

Crude protein (%) = Nitrogen (%)×6.25

Ash

Ash content of sample was estimated by using standard method of AOAC (2005). 5 gof samples was transferred in a pre-weighed crucible and ignited until no charred particles remained in the crucible. The crucible was then placed in a muffle furnace (600^0C) for 3 hours. The crucible was cooled in a desiccators and weighed to a constant weight. The difference between the weights of the silica crucible with ash and empty was the amount of total ash.

$$\text{Ash}(\%) = \frac{\text{Weight of ash}(g)}{\text{Weight of sample}(g)} \times 100$$

Storage Study

The shelf -life of the healthy pancake premix was evaluated for physico-chemical analysis for 21 days of storage period at room temperature. Various parameters were studied after regular interval of 7 days. The premix was packed in two types of packaging material i.e. laminates and polypropylene and the quality parameters of both the packaging material were evaluated.

Results and Discussion

Chemical Composition of raw flours

The analysis of moisture content of different flours was done by using hot air oven method. As indicated in Fig.2, the moisture content was higher in buckwheat flour having value 11.61 percent followed by amaranth flour having value 9.75 percent and fox nut flour having value 9.3 percent. The fat content was determined by using soxhlet extraction. As indicated in Fig. 2, highest fat content was reported in amaranth flour having value 9 percent followed by buckwheat flour having value 2.52 percent and fox nut flour having value 1 percent.

Also, the ash content was determined using muffle furnace and from Fig.2, it was indicated that highest ash content was found in amaranth flour having value 3 percent and lowest in fox nut flour having value 0.8 percent. Similar findings were reported by Bhavsar *et al.* (2011) and (Sangeeta and Grewal, 2018). Kumar *et al.* (2016) revealed that popped makhana has the capacity to absorb moisture as compared to raw seeds of makhana. Thus, the above results are corroborated with the findings**.**

Physical analysis

From the table 1, it was observed that bulk density and tapped density of samples (C_1 and C_2) of premix was found to be 0.56 g/cm^3 and 0.76 g/cm^3 respectively followed by samples (T_1 and T_2) i.e. 0.47 g/cm^3 and 0.60 g/cm^3 at zero day. After 21 days of storage period, the bulk and tapped density of samples (C_1 and T_1) packed in laminates remained constant but it was observed that there was a decrease in samples (C_2 and T_2) i.e. (C_2) with values 0.46 g/cm^3 and 0.52 g/cm^3 and (T_2) having values 0.40 g/cm^3 and 0.42 g/cm^3, which may be due to poor sealing properties of packaging

material i.e. polypropylene. The above results are corroborated with the findings of (Yu *et al*., 2013) in which he concluded that the reason behind the decrease of bulk density and the tapped density is the hygroscopic nature of the premix in protein rich extruded products prepared from soy protein isolate-corn flour blends.

Chemical analysis

Crude Protein

It was concluded from the table 2, that at zero day, the protein content in samples (C_1 and C_2) of premix was 11.76 percent followed by samples (T_1 and T_2) i.e. 10.56 percent. After 21 days of storage period, a decrease in the protein content was observed. The highest protein content was recorded in sample C_2i.e. 11.56 percent followed by samples C_1 i.e. 11.55 percent, T2 i.e. 10.49 percent and was found to be lowest in sample T_1 i.e. 10.48 percent. The decrease might be due to hydrolysis of peptide bonds by the help of protease enzyme that causes splitting of protein molecules, denaturation and degradation of protein into amino acid during storage (Bhat *et al.,* 2014). Similar trends were reported by (Parvin *et al*., 2014) in cereal Based highly nutritive supplementary food stored for 3 months.

Ash content

From the table 3, it was concluded that at zero day, the ash content in samples (C_1 and C_2) of premix was 2.50 percent followed by samples (T_1 and T_2) i.e. 2.97 percent. After 21 days of storage period, a decrease in the ash content was observed. The highest ash content was recorded in sample T_1 i.e. 2.95 percent followed by samples T_2 i.e. 2.92 percent, C_1 i.e. 2.47 percent and was found to be lowest in sample C_2 i.e. 2.45 percent . The reason for low ash content in control (C_1 and C_2) may be due to the major proportion of buckwheat flour. Results are corroborated with the findings of (Wronkowska and Simetana, 2011) in which it was reported that low ash content in buckwheat may be due to the higher mineral content of microelements iron and zinc while those of manganese and copper were low. Also, the decrease in ash content might be due to the mineral losses from binding of minerals by maillard reaction products during storage (Nadarajah and Mahendran, 2015). Thus, the decrease in ash content in samples (C_2 and T_2) packed in polypropylene was found to be more as compared to samples (C_1 and T_1) in laminates.

Conclusion

Thus, from the experiment it could be concluded that the gluten-free formulations can use a variety of whole grains free of gluten, including buckwheat and amaranth. These gluten-free ingredients contain a lot of fibre and minerals, as well as high-quality protein. It is clear from the study that pseudocereal pancake premix can be stored for more than 21 days with minimum changes in nutritional quality.

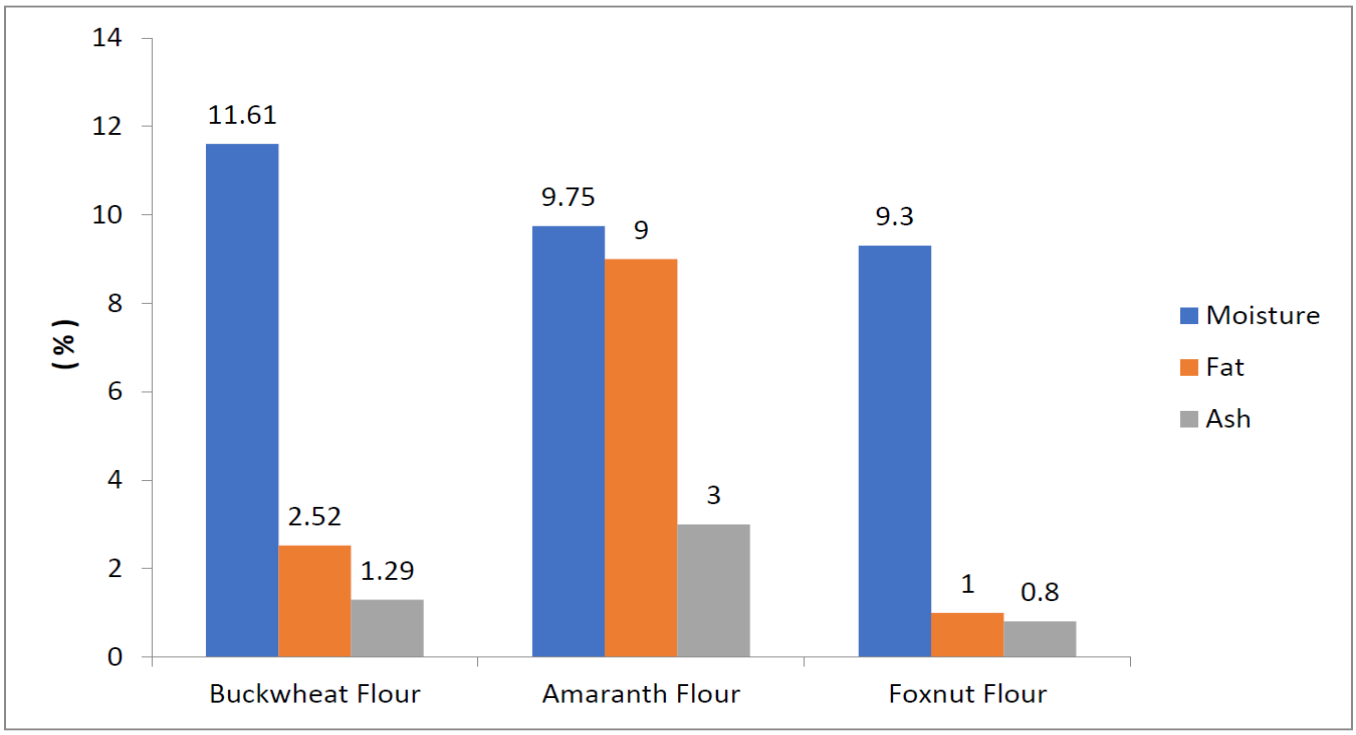


Fig. 2 : Graphical representation of chemical composition of raw flours

Table 1 : Physical analysis of Healthy Pancake Premix packed in laminates and polypropylene.

Treatments	Bulk density (g/cm^3)				Tapped density (g/cm^3)			
(Storage interval days)	0	7	14	21	0	7	14	21
C1(55::BWF)	0.56	0.56	0.56	0.56	0.76	0.76	0.76	0.76
C2(55::BWF)	0.56	0.52	0.48	0.46	0.76	0.67	0.60	0.52
T1(30:15:10::BWF:AF:FF)	0.47	0.47	0.47	0.47	0.60	0.60	0.60	0.60
T2(30:15:10::BWF:AF:FF)	0.47	0.46	0.43	0.40	0.60	0.56	0.48	0.42
Mean (Storage)	0.51	0.50	0.48	0.47	0.68	0.65	0.61	0.57

BWF: Buckwheat Flour AF: Amaranth Flour FF: Foxnut Flour

Table 2 : Effect of storage period on crude protein content (%) of healthy pancake premix stored at room temperature

TREATMENTS	STORAGE INTERVALS (DAYS)			
	0	**7**	**14**	**21**
C1(55::BWF)	11.76	11.69	11.61	11.55
C2(55::BWF)	11.76	11.68	11.62	11.56
T1(30:15:10:BWF:AF:FF)	10.65	10.58	10.52	10.48
T2(30:15:10:BWF:AF:FF)	10.65	10.57	10.51	10.49
Mean (Storage)	11.20	11.13	11.06	11.02

BWF: Buckwheat Flour AF: Amaranth Flour FF: Foxnut Flour

Table 3: Effect of storage period on ash content (%) of healthy pancake premix

TREATMENTS	STORAGE INTERVALS (DAYS)			
	0	**7**	**14**	**21**
C1(55::BWF)	2.50	2.49	2.48	2.47
C2(55::BWF)	2.50	2.48	2.47	2.45
T1(30:15:10:BWF:AF:FF)	2.97	2.96	2.96	2.95
T2(30:15:10:BWF:AF:FF)	2.97	2.95	2.94	2.92
Mean (Storage)	2.73	2.72	2.71	2.70

BWF: Buckwheat Flour AF: Amaranth Flour FF: Foxnut Flour

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