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Evaluation of Air-dried Pumpkin Powder for increase utilization

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Abstract

Production and development of Pumpkin powder (*Cucurbita moschata*) was evaluated in this study . Fruits were obtained from the farm of Food Research Center (27 KM north Khartoum-sudan) . Pumpkin fruits were treated with Ascorbic acid of (0.15%) total soluble solids concentration prior to drying. Triplicates trials has been processed. The fruit components, overall dry ratio, dry ratio and peeling loss, were estimated. Physiochemical properties of the fresh pumpkin and the produced powder such as moisture content, ash content, crude fibre, protein, fats and carbohydrates, were determined. It was found that pumpkin pulps retained their quality although, the contents of the mentioned constituents were found to be lesser in the produced powder. Reconstitution characteristics of the processed powder such as wettability, sinkability, and bulk density were also determined. bulk density was (0.57), wettability (205.5) sec, sinkability (376) sec, The results of vitamins tests (potassium, calcium,, sodium, phosphor) of the powder revealed that although the produced pumpkin powder are affected with processing procedure, the powder have an excellent quality attributes which cope with using it as a food supplement.

Keywords: pumpkin powder, physiochemical properties, Reconstitution characterstics

1. Introduction

Pumpkin is a seasonal crop belongs to the family of Cucurbitaceae .It is very important for human consumption, having numerous culinary uses, either as a vegetable or as an ingredient in food preparations like pies, soups, stews or breads. (Doymaz, 2007) It is a good source of carotene, water-soluble vitamins and amino acids, being relatively low in total solids, usually ranging between 7 % and 10 % (Alibas 2007,), (Arévalo, and Murr,2006). This chemical composition rich in antioxidants and vitamins, gives pumpkin an important health protecting effect. Fresh pumpkins are very sensitive to microbial spoilage, even at refrigerated conditions, they must be frozen or dried (Doymaz, 2007). It is very important to have knowledge about its nutritive value in order to encourage the increase in its consumption and usage for nutritional and technological applications. Drying operations are important steps in the chemical and food processing industries being one of the most widely used primary methods of food preservation. (Krokida et al 2003). The basic objective when drying food products is to remove water from the product up to a level that drastically minimizes microbial spoilage and deterioration reactions. (Krokida et al 2003). Thus, the dried products can be stored for a longer period (Doymaz,.2007 , Sacilik, .2007), apart from other advantages, such as smaller space for storage, lighter weight for transportation and storage under ambient temperatures, with important economic savings (Doymaz,.2007 , Sacilik, .2007), Different drying methods are used for fruits and vegetables, being currently hot air drying the most widely used method in post-harvest technology of agricultural products. However, during drying many changes take place inside the foods, and these structural and physical-chemical modifications affect the final product quality, particularly in relation to the quality of the fresh products (Sacilik, .2007),]. In fact, the high temperatures in the hot air drying lead to an important loss of product quality, namely in relation to composition and the nutritional value as well as physical properties, density, porosity, mechanical properties and organoleptic quality of the product (Alibas, 2007).

Various reasons made Sudan has suitable conditions for the success of drying processing, for instance, rise of temperature degrees, especially at summer period, as well as increased production of fruits and vegetables including pumpkin. Although, Sudanese people have known the cultivation of pumpkin for many decades and they planted different cultivars of it in assorted areas, a limit numbers of products based pumpkin, excepting Jam were manufactured. However, with the absence of studies conducted on processing pumpkin into a powder for increase utilization. The aim of this research is to process pumpkins into a powder form, which could be used as a supplement, creating its multipurpose uses and improving quality of diets, hence that will increase utilization of the crop in Sudan and minimize the losses.

2. Materials and Methods

2.1 Materials:

-A registered pumpkin variety fruit (*Cucurbita moschata*) which is planted in the farm of National Food Research Centre (NFRC) (27 KM North Khartoum State, Sudan were used in this study.

-Ascorbic acid obtained from the lab of Food Dehydration department of (NFRC).

2.1.1 Raw Materials Preparation:

Pumpkin were washed under running tap water then distilled water .The pumpkin fruits were peeled, Pumpkin seeds and peels were weighed.

2.1.2. Preparation of pumpkin powder:

The peeled pumpkin was cut into approximately 1 inch cubes using (Electronic Dicer). The pumpkin cubes were then immediately dipped into (0.15%) Ascorbic acid solution for 3 minutes . The treated pumpkin cubes were spread on perforated stainless steel trays (45 cm wide, 75 cm long and about 7 cm height) manually. Two kgs of pumpkin cubes were loaded on a perforated stainless steel trays and left to dry under shade with the aid of fans for four days. The dried cubes were collected, reweighed and ground using household grinder and stored at 25-27ºC in sealed plastic bags prior to further analysis. Then the overall drying ratio, drying ratio and the peeling loss were calculated according to Singh (2007) as follows:

Overall drying ratio = raw material**:** dry product weight

Drying ratio = prepared material**:** dry material

Peeling loss (%) = weight of peels × 100/weight of raw material

2.2Analytical Methods:

Physicochemical analyses were carried out for the following parameters:

Moisture content, protein, ash, crude fiber, fats and carbohydrates to AOAC (2008) methods. . Minerals were determined according to methods of AOAC (1990). All proximate analysis was performed in triplicate.

Reconstitution characteristics for the pumpkin powder: Wettability, sinkability and bulk density (g/L) were estimated according to the method recorded by Neff *et al.* (1967).

Minerals were determined according to methods of AOAC (1990). All proximate analysis was performed in triplicate.

2.2.1 Statistical Analysis:

The experiment was designed using completely randomized design. Data generated was subjected to Statistical Package for Social Science (SPSS) software version 16.0. Means were separated using Duncan's Multiple Range Test (DMRT) according to Mead and Gurnow (1981). The Least Significant Deference (LSD) at 5% level of significance was used.

3. Results and Discussion

Table (1) shows that the overall drying ratio of pumpkin fruits (20.3:1), drying ratio (16.4:1) and peeling loss (18.3).

Table (1): Pumpkin fruits drying

Peeling lose	Drying ratio	Over all drying ratio
18.3	16.4: 1	20.3 : 1

The above value represents the means of values

Table (2) displayed a comparison between chemical constituents of the fresh pulp and processed pumpkin powder .These differences were found to have significant values in some parameters, reflecting how far the fresh pulp has been affected by some parameters during processing Evaporation of water during processing lead to a reduction of moisture content range in the fresh pulp from (84.3±0.30[a] %) to **(**4.63±0.06[b] **%)** in the powder, Which is agree with the findings reported earlier by **(**Pongjanta, J.et al 2006).they reported (84.32±3.75),6.1±1.47) for fresh pulp and the produced powder respectively. The results of protein shown in table (2) indicate that the protein content in the powder was (1.53±0.15[b]**)** is lesser than the protein content in the fresh pulp (3.37±0.06[a]), since the protein content is directly related to the fiber content it was also found that the fiber content of the powder (2.10±0.10[b]) is lesser than in the fresh pulp (3.08±0.02[a]) and this may contribute to the leaching of soluble amino acids in the ascorbic acid solution used.

Table (2): Chemicals Composition of pumpkin fresh and powder:

Sample	Moisture %	Ash %	Protein %	Fat %	Crude fibre %	Carbohydrates
Fresh	84.3±0.30[a]	3.40±0.10[a]	3.37±0.06[a]	1.70±0.10[a]	3.08±0.02[a]	4.21±0.26[b]
Powder	4.63±0.06[b]	1.53±0.15[b]	1.53±0.15[b]	1.10±0.10[a]	2.10±0.10[b]	74.00±1.81[a]
$Lsd_{0.05}$	7.96**	0.87*	0.424*	0.655[NS]	0.952*	6.487*
SE±	1.058	0.439	0.172	0.376	0.641	1.022

Mean bearing different superscripts significantly different (p≤ 0.05)
Values are mean±SD.
Any two mean values having different superscript letters in a column are differ significantly (P≤0.05).
NS ≡ is considered no significant,
* ≡ is considered significant (P≤0.05);
** ≡ is considered highly significant P≤0.01.

Table (2) showed the ash content in the fresh pulp (3.40±0.10a %) was higher than in the powder (1.53±0.15b %). The results for fat shown in table 2 revealed that there is no significant difference between the fresh pulp (1.70±0.10[a]) and the processed powder (1.10±0.10[a]). Carbohydrates results revealed that the powder is higher in carbohydrates (74.00±1.81[a]) compared with the fresh pulp (4.21±0.26[b]), which not far from the earlier finding reported by (Pongjanta, J.et al 2006), they reported (78.77a±5.42), (10.51b±1.08) for the powder and fresh pulp respectively.

The data resulted from the mineral estimation had been shown in table (3). The value for sodium in powder is higher (0.350±0.460[a]) than in the fresh pulp (0.054±0.001[a]). The value obtained for, potassium (2.25±0.05[a]), Calcium (0.73±0.01[a]) and phosphorus (0.47±0.49[a]) of the fresh pulp is higher than potassium (0.29±0.03[b]), Calcium (0.24±0.02[b]) and phosphorus (0.16±0.02[b]) of the powder. The reduction in mineral content in the powder may be due to the losses during different steps of processing However, the nutritive value of the produced pumpkin powder could be considered as enrich stuff.

Table (3): Minerals content of the pumpkin powder:

Pumpkin sample	K	Na	Ca	P
Fresh	2.25±0.05[a]	0.054±0.001[a]	0.73±0.01[a]	0.47±0.49[a]
Powder	0.29±0.03[b]	0.350±0.460[a]	0.24±0.02[b]	0.16±0.02[b]
$Lsd_{0.05}$	0.96*	0.275[NS]	0.384*	0.296*
SE±	0.058	0.0139	0.0272	0.0176

Table (4) Shows The physical and reconstitution properties of pumpkin powder .The bulk density is 0.57g/L, wettability 205.5sec, sinkability 376 sec.

Table (4): Physical and reconstitution characteristics of dried pumpkin powder

Bulk density gm/ml	Wettability sec	Sinkability sec
0.57	**205.5**	**376**

4. Conclusion

It was concluded that pumpkin powder could be used as enrich stuff and an excellent improved supplement of diet. Comprehensive utilization of dried fruit studies will minimize material losses and environmental pollution. The results of this work could be help the researchers in transferring the knowledge on processing dried pumpkin and it is expected to give advantageous guidance to the local communities interested in cultivating , processing and consuming the dried fruit.

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