International Journal of Multidisciplinary Research and Publications
ISSN (Online): 2581-6187

Development of a Quick Dried Soup Powder Mixes and Easy to Prepare

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***Abstract*—** *The demand for dried quick soups is increasing to their ease of use. This study was conducted to develop a quick soup mixture incorporated with different concentrations of orange sweet potato flour. (Ipomoea batatas) and chickpea flour (Cicer arietinum L.) and to evaluate physical and reconstitution properties, organoleptic parameters and microbial quality. The fresh orange sweet potato (OSP) and chickpea seed were dehydrated and produced flour in the laboratory, and then were added to this soup mixture for three formulated at: 0%, 40%, 50% and 100%, 60%, 50% respectively. The results indicate that the soup made from 50% orange sweetpotao flour (OSPF) were highest mean in optical density at 330 nm was (1.79). Hygroscopicity test at the relative humidity (R.H) 52% and 26˚C for the dry soup mix revealed that the product is hygroscopic. The sorption isotherm at 30˚C and different equilibrium relative humidities (ERHs) have shown that fungal growth occurred at the high ERH (86%) and caking was observed even at very low ERH (23%).Total bacterial counts was in acceptable levels for consumer at processing. E. coli, Salmonella, yeast and mould has not detected in all samples during the storage period.. Sensory evaluation results reflected that there were no significant differences (P≤ 0.05) between a dry soup mixes composed of 40% and 50% OSPF, also the soup mix that contained 40% OSPF gave highest scores in appearance, taste, flavor, consistency and overall acceptability.*

I. INTRODUCTION

The nutrient content of most of soups available in the market is high in carbohydrate and low in protein and vitamins. Deficiencies of nutrients are a major global health problem, more than 2 billion people in the world today are estimated to be deficient in key vitamins and minerals, particularly vitamin A, iodine, iron and zinc. The advantages of the dehydrated foods, particularly, dry soup mixes could be as protection from enzymatic and oxidative spoilage and flavor stability at room temperature over long periods of time (6 - 12 months). Also, they do not need refrigerator and had quite nutritive value, particularly as a source of protein. In addition, they are ready for reconstitution in a short time for working families, hotels, hospitals, restaurants and institutional use as well as to military rations. Moreover, they exert light weight for shipping and availability at all time of the year [2]-[5].

As mentioned by the United States Department of Agriculture (USDA, 2000), the dehydrated vegetable soups can be classified also into three types according to the following definitions:

Type1-quik cooking soups: when it can be prepared by cooking in boiling water for only 5 minutes.

Type11-instant cooking soup: when it can be reconstituted in boiling water in approximately one minute.

Type 111 slow cooking soups: when it can be fully reconstituted in boiling water for more than 40 minutes.

As the formulation and development of nutritious complementary foods from locally and readily available raw materials (orange sweet potato and chickpea) as they are rich a high beta carotene and protein, have received a lot of attentions. The present research work aimed:

1-To development a quick soup mixtures powder from orange sweet potato and chickpea with supplemented a whey powder and some other additives for easily preparation cooking.

2- Evaluating their physical and reconstitution characteristic,

3- Investigation the sensory organoleptic attributes and to assess microbial quality during storage period of soups mixtures.

II. MATERIALS AND METHODS

2.1 Materials:

2.1.1. Processing of the sweet potato flour:

One variety of orange sweet potatoes was obtained from the Agricultural Research Corporation (Shambat). The tuber was washed with filter tap water and peeled using sharp stainless steel knives. The peels was cut into cubes using (Electronic Dicer), and then immediately dipped into ascorbic acid (0.15%) under moving fans for 5 days. The dried cubes of sweet potato were milled into fine flour and packed in polyethylene till use

2.1.2. Chickpea flour:

Chickpea brought from the local market and then cleaned. The clean seed soaked with tap water for three hours with interval water changing every hour. The seeds were ground and dry under the fans for four days. The dry chickpea was milled into fine flour and then roasted on a stainless steel pan for two minutes at 50 to 60˚C with continuous mixing.

2.1.3. Whey powder:

Fresh sweet whey were collected from the animal products department at the National Food Research Center as the by-product of cheese making, and then pasteurized at 72˚C. Pasteurized whey was concentrated using double jacketed kettle to 17 brix concentrations. Gum Arabic powder was added at the rate of 1% (w/w) and stirred till completely dissolved and the solution filtered through a cheese cloth. The above sample was spray-dried using (ANHYDRO TYPE LAB, S1, Copenhagen, 1974) spray drier. A fine spray of

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whey was forced rapidly through a stream of heated air at an inlet temperature of 160-170˚C and an outlet temperature of 95˚C. The flow rate and the pressure were adjusted to 32ml / min, 1.5 kg f /cm^2, respectively. The produced powder was weighed, packed in polyethylene bags and then kept at -18˚C until needed.

2.1.4. Additives:

1- Dried spices brought from local market
2- Parsley collected from local market and then shade dried.
3- Wheat flour, Iodized salt, citric acid, and full cream milk powder were purchased from a super market.
4- Dried Onion powder provided by the dehydration section of National Food Research Center.

2.1.5. Recipe formulation of ready to serve dry soup mix:

Random amounts of pre-weighed ingredients (using orange sweet potato, chickpea flour

and additives) above mentioned were taken by a sterile spatula and mixed well. Placed into a500 ml warm distilled water and cooked with continuous stirring for 6 minutes. The soup presented a few semi trained panelists to record their observations and comments. The panelists were asked preliminary to point out their general acceptability and preference as for as the taste and constitution were concerned without scoring. After fixing the amounts of salt and spices according to their comments of recipes were formulated and then three recipes were formulated as follow: 100: 0, 60: 40, 50:50 %for chickpea and orange sweet potato flour respectively.

2.1.6. Organoleptic evaluation of the resultant soup samples:

The resultant soup samples were organolyptically evaluated after dissolving in hot water (55 g dried soup mixtures/500 ml water) for its sensory characteristics, appearance, taste, flavor, consistency, and overall acceptability.

2.1.7. Shelf life assessments:

The shelf life was measured for prepared different soup formulas packed in polyethylene packets and stored ambient temperature during nine month period. Shelf life was determined by measuring of changes of the physical, reconstitution characteristics, sensory organoleptic and to assess microbial quality.

2.2. Analytical Methods:

The Physical analysis and reconstitution characteristics include: color intensity described by the (Handel *et al*., 1950). bulk density, wettability and sinkability, dispersibility was described by Abdel Kareem (1973), hygroscopicity, sorption isotherm according to Wink (1964), flowability describe by Frain (1953), solubility as described by A.D.M.I. (1970).

2.2.1 Organoleptic test:

A hedonic scale was described by Amerine *et al*. (1965).

2.2.2 Microbiological analysis: Sterilization, serial dilution and preparation of the media were done according to Harrigan and MacCance (1976).

2.2.3 Statistical Analysis: The recorded data were analyzed, following the procedure described by Gomez and Gomez (1984) for a factorial experiment in a completely randomized design.

III. Results and Discussion

3.1. Physical Properties of the Dried Soups Mix:

Tables (1 and 2) showed that there were highly significant differences ($P \leq 0.05$) among the tested soups in the color intensity due to the storage period interactions. Its observed that the color intensity increased with the high amount of orange sweet potato flour added, this could be explained that the orange sweet potato high rich in β -carotene amounting to 3758⁄ 100 g(fresh weight) by researchers studies (Khalafalla *et al*., 2008) which impart the orange color. The progress of storage period has gradually decreased color intensity, which might be a result of the direct effect of light and the permeability of the packing material dependent, since polyethylene offer little protection against light and oxygen (Pruthy, 1978).The highest bulk density value 0.719gm/ml in Table(2) was obtained in control soup(0.714mg/ml). Generally, the bulk density of all soup recipes were found to be low, beside during the storage period there is significant difference between the samples after 1.5- 3 months and the rest of the storage period and. there is no significant difference between 4.5 , 6, 7.5 and 9 months.

3.2. Reconstitution Characteristics Proprieties for the Soup Mixes:

From table (3), it is obvious that the wettability and sinkability decreased with the increase of the chickpea ratio, this could be due to the fact that the wettability properties depend on the affinity of the protein to water and other polar solvents (Abdel Kareem and Brennan, 1975). The control soup formed a lump on the surface of the water which resisted complete wett. and sink. for a longer time (220 sec., 223 sec.), compared with the soups with 40% and 50% orange sweet potato flour. This means that the soups with the orange sweet potato flour had better wetting since it took a shorter time Elkashan (2006). The solubilities were similar among the three soup mixes, the amount of high sediment in soup mix is a reflection to the presence of high amounts of insoluble materials.

The results observed that there was no change in the angle of repose (45˚) due to the addition of OSPF and hence the flow property of all the soup mixes. The dispersibilities generally of the soup mixes were comparatively low, this could be due to the fact that the soup overcome during cooking of the soup mixes for consumption.

Table (1): Mean values of color intensity at 330nm of dry soup mixes during different storage period

Period (months)	Soup recipes		
	S_0	S_{40}	S_{50}
0	0.714[a]	0.697 [a]	0.697 [a]
1.5	0.698 [a]	0.677[b]	0.673[b]
3	0.698 [a]	0.682[b]	0.689[b]
4.5	0.733 [a]	0.697 [a]	0.723 [a]
6	0.733 [a]	0.697 [a]	0.723 [a]
7.5	0.731 [a]	0.714 [a]	0.706 [a]
9	0.731 [a]	0.697 [a]	0.689[b]

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Table (2): Mean Bulk densities (gm/ml) of dry soup mixes during different storage period

Period (months)	Soup recipes		
	S_0	S_{40}	S_{50}
0	1.48^{f}	1.59 c	1.79 ^{a}
1.5	1.48^{f}	1.59 c	1.77 ^{a}
3	1.47^{f}	1.57 c	1.66 ^{b}
4.5	1.46 ^{g}	1.54^{d}	1.56 ^{b}
6	1.43 ^{h}	1.53 ^{de}	1.51^{C}
7.5	1.42^{h}	1.44^{gh}	1.56 ^{b}
9	1.33^{i}	1.42 ^{h}	1.49 ^{f}

Values with the same letter are not significantly different (P≤0.05).
S_0 = Soup with 0% orange sweet potato flour, 100% chickpea flour (Control).
S_{40} = Soup with 40% orange sweet potato flour, 60% chickpea flour.
S_{50} = Soup with 50% orange sweet potato flour, 50 % chickpea flour.

Table (3): Reconstitution characteristics for the dry soup mixes.

Sample	Wettab. Sec.	Sinkab. Sec.	Solub.index (ml.sediment)	Angle of repose	Despersib.	
					O.D *	T% **
S_0	220	223	40	45˚	0.474	57
S_{40}	161	162	42	45˚	0.436	58
S_{50}	130	132	42	45˚	0.423	58

**T% = Percentage transmission
*O.D = Optical density

3.3 Hygroscopicity and Sorption Isotherm:

Fig.(1) and (2) shows that Hygroscopicity and sorption Isotherm of dry soup mix made from 40% orange sweetpotato which was found to be the high score according to the panelists' choice. The Hygroscopicity as shown in Fig. (1) has been carried out at35±0.5˚C and 52% RH i.e. the ambient temperature Abdel Kareem M.I. (1973) had used it in a study some factors that affecting reconstitution characteristic of the spray-dried karkadeh powder. The results of the sorption isotherm fig.(2) constructed for the soup mix revealed that even the sample stored under 23% relative humidity needs some precautions in packaging to avoid caking of the sample and color changes.

3.4. Microbial quality of dry soup mixes

Table (4) shows the effect of storage period on total bacterial count. The total bacterial count (cfu/g) at zero time for control was 6.0 x10^4 (cfu/g) and reached 2.0 x 10^3 (cfu/g) at the end of the storage. On the anther hand the soup made of 40% and 50% (OSPF) the total count bacteria was decreased till 4.5 months of storage and not detected at the end of the storage period. These results were in accordance with the Tardif-Douglin *et al*. (1993). It was noticeable that all dry soup mixes tested were free from E. coli, Yeast and moulds and Salmonella spp. respectively, throughout all the storage period.

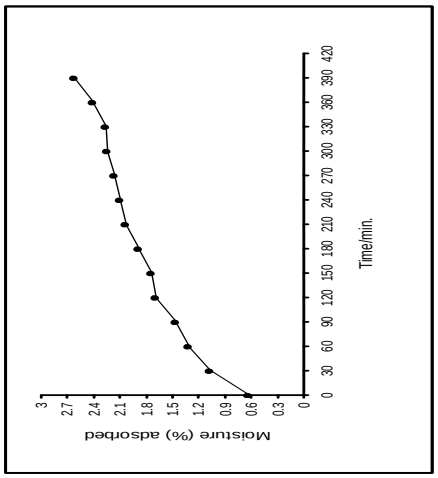

Fig. (1): Hyg roscopicity

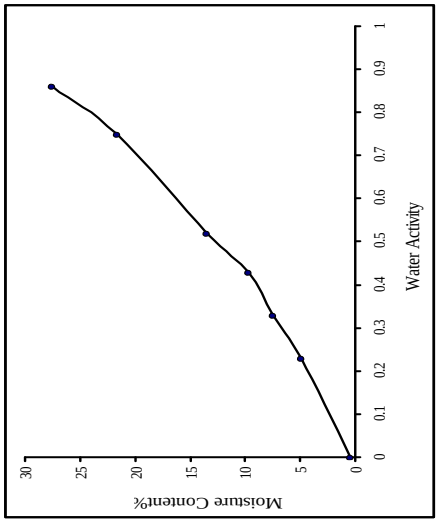

Fig. (2): Water Sorption Isotherm

Table (4): Microbial quality of dry soup mixes during different storage period

		Soups recipe		
Parameters	Month	S_0	S_{40}	S_{50}
Total viable count	0	6.0 x 10^4	9.0×10^4	6.5 x 10^4
	4.5	1.5 x 10^4	1.0 x10^4	4.0 x10^4
	9	2.0 x 10^3	-ve	-ve
E.coli	0	-ve	-ve	-ve
	4.5	-ve	-ve	-ve
	9	-ve	-ve	-ve
Salmonella spp.	0	-ve	-ve	-ve
	4.5	-ve	-ve	-ve
	9	-ve	-ve	ve
Yeast and mould	0	-ve	-ve	-ve
	4.5	-ve	-ve	-ve
	9	-ve	-ve	-ve

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Table (5): Observations on the dry soup mix under different equilibrium relative humidities (ERHs)

E.H.R.%	0	23	32	43	52	75	86
Observations	No change in color	Slightly caked	moist with color change	moist with color change	slight fungal growth	Complete fungal growth	Complete fungal growth

Table (6): Sensory evaluation of dry soup mixes during storage.

		Recipes		
Parameters	Storage (month)	S_0	S_{40}	S_{50}
Appearance	0	6.07[b]	8.07 [a]	7.87 [a]
	4.5	6.07 [b]	7.73 [a]	7.4 [a]
	9	6.7 [b]	6.93 [b]	6.4 [b]
Taste	0	6.07 [a]	7.13 [a]	7.07 [a]
	4.5	5.93 [a]	7.13 [a]	7.27 [a]
	9	6.27 [a]	6.53 [a]	6.13 [a]
Flavor	0	6.6 [a]	7.13 [a]	7.01 [a]
	4.5	6.3 [a]	6.93 [a]	7.0 [a]
	9	6.4 [a]	6.6 [a]	6.1[a]
Consistency	0	5.5[a]	7.6 [a]	7.3 [a]
	4.5	6.0 [a]	7.1 [a]	6.9 [a]
	9	6.0 [a]	7.0 [a]	6.9 [a]
Overall acceptability	0	6.1 [a]	7.5 [a]	7.4 [a]
	4.5	5.8 [a]	7.3 [a]	7.4 [a]
	9	6.5 [a]	7.0 [a]	6.5 [a]

3.5. Sensory Evaluation of Dry Soup Mixes:

From table (6), there are no significant differences among all parameters except appearance in the control soup, than the other two soups. The soup made of 40% orange sweet potato flour recorded highest values in appearance (8.07 a), taste (7.13 a), flavor (7.13 a) consistency 7.6 a), and overall acceptability (7.5 a) at the beginning of the processing.

IV. CONCLUSION

In this study, the results illustrate that the soup powder is good for reconstitution characteristic when as dissolved in tap water also there was a little changes in color intensity and without affected in the bulk density during storage pried months, addition to it have an acceptable sensory evaluation and microbial quality and it can stored in ambient temperature condition without any affecting in the two parameter above.

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