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Production and Evaluation of Lentil Soup and Bissarah

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THE AIM of this study was to production and evaluation of Lentil soup and Bissarah as precooked foods could be prepared in few minutes.

Shifting to the results, it was reported that dried lintelsoups and Bissarah had high protein content (24.07 and 21.75 %), potassium is the most predominated elements with values of 797 mg/100g in dried lentil soup and 546 mg/100g in Bissarah. HPLC technique showed that Lentil soup and Bissarah were rich in leucine, lysine, and arginine as essential amino acids, as well glutamic and aspartic acids as non-essential amino acids. Result showed that the Bissarah extract had higher total phenolic content, than Lentil soup extract. Gallic acid, Pyrogallol, Vanilline were detected to be the major phenolic components in Bissarah extract meanwhile, Pyrogallol was the predominant in Lentil soup extract. Bissarah and Lentil soup may be good sources of antioxidant agents, which its extracts had the lowest value of IC_{50} (1.2 and 0.77mg/ml) respectively. Antinutritional factors as phytic acid decreased in the end product, as a result of cooking and heat treatment. During storage period for six months there is no a remarkable changes in all of protein, fat, ash and fiber contents in both of dried lintel soup and Bissarah. As well these products were characterized by high microbiological quality where the number of microbes and detection of aflatoxinsare within the Egyptian standard specifications values. Sensory evaluation were acceptable for both lentil soup and Bissarah.

Therefore, we recommend publishing the importance of these food products (dried lintelsoups and Bissarah) as a food rich in minerals, fibers, phenols and antioxidants, at the same time an easy to prepare and inexpensive food.

Keywords : Legumes, Phenolic components, Antioxidant activity.

Introduction

The modern lifestyle for some people today, such as those living in large cities, needs a fast pace including food preparation and processing. It creates a community that loves instant food products ready to eat. Among the most instant foods, to meet the social requirements of consumers, dried soups play a vital role (Krejov, et al., 2007). Dried foods, such as the mixes of dry soup, are characterized by protection from enzymatic spoilage, oxidative spoilage, and have consistent flavor at the room temperature for long time (El Wakeel, 2007). Solegumes and vegetables added in dried soups to support them with full nutritional value, such as carbohydrates, proteins, fiber and amino acids (Pandey et al., 2006). Legumes are rich sources of carbohydrates, proteins, fats, minerals, fiber, antioxidants and vitamins. Legume seeds have protein contents about of 17% - 40%, which is typically twice the amount found in cereals and equal protein contents found in meat (18-25%). Also, They are a good source of lysine but they are poor in sulfur amino acids, such as methionine and cysteine (Swaminathan, 1988).

Health benefits of legumes include protection from cardiovascular disease due to the high content of dietary fiber (Alghamdi, 2009), increased

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iron absorption because they contain vitamin C (Acar et al., 2009) bone health promotion (Hinterthuer, 2016). Moreover, the whole pulses are a plentiful source of some minerals such as iron, zinc, potassium, phosphorus, selenium, folic acid, isoflavones and tocopherol (Jain et al., 2009). Therefore it is preferable to make pulses as a natural preservative for obesity and related disorders including coronary heart disease, diabetes, metabolic syndrome (Amarowicz, 2008 and Hangen & Bennink, 2002). It is therefore recommended to take them as part of a healthy eating by health organizations for low index of glycemic (Khan et al., 2008).

Legumes contain a large proportion of biologically active phenolic compounds. The basic phenolic compounds found in legume seeds include condensed tannins, phenolic acids, and flavonoids.

Lentil (seed coat) contains catechins and procyanidins by 70% of the total phenolic compounds (Singh et al., 2017a).

Phenols play a powerful role as an antioxidant because they are able to scavenge free radicals, break radical chain reactions, and metal chelation, beside its health benefits such as reducing cancers and cardiovascular risks diseases (Han and baik, 2008).

The disadvantage of legume seeds is the presence of phytic acid as anti-nutritional factors, some enzyme inhibitors (trypsin and chymotrypsin proteinase inhibitors), lectins and saponins. Lack of minerals such as (iron, zinc, magnesium) in the human body of the most important health problems caused by these factors (Parca, et al., 2018). Different treatments are common on legumes before consumption, some of which are soaked, boiling, cooked by microwave, extrusion, autoclaving, germination, etc. These treatments affect the anti-nutritional factors such as tannins, trypsin inhibitor activity, phytic acids, hemagglutinin, etc by inhibiting or reducing them (Abbas and Ahmed, 2018).

This study aimed at the production and evaluation of the nutritive values of dried lintel soups and Bissarah.

Materials and Methods

Materials

The raw materials used in this investigation include:

Mature decorated dehulled Lentils (*Lens culinaris*) and crushed broad bean (*Fava beans*) seeds, Fresh tomato (*Solanumlycopersicum*), yellow carrot (*Daucuscarota*), onion (*Allium cepa*), garlic (*Allium sativum*) and dried Jew's mallow (*Corchorusolitorius*), Coriander (*Coriandrumsativum* L), cumin (*Cuminumcyminum*), black pepper (*Piper nigrum*) powders and salt were purchased from the local market in Fayoum City, Fayoum governorate, Egypt.

Methods

Technological treatment

Preparation of dehydrated precooked foods (Dried Lentil and dried Bissarah meals):

Both of dehulled Lentil and broad bean matured seed were cleaned, washed then mixed with the rest of ingredients given in Tables 1 and 2 except for cumin in case of Lentil meal and black pepper in case of Bissarah meal. These ingredients were cooked in hot water under pressure at 95˚C for 15 min, cool the mixture and mix well using Braun Multiquick Blender. The mixture then screened using screen for separating any pomace. uniqueness of the resulting dough on aluminum trays and then dried in hot air flow oven, in the first four hours at 70°C and then reduced to 50 °C until complete drying.

The dried blends were milled using a laboratory mill and seasoned with cumin powder for Lentil soup and black pepper powder for Bissarah and sieved through 60 mesh sieve into powdered form. Keep these powders in polyethylene bags at room temperature for 6 months. At regular intervals (Bimonthly) Various analyzes are conducted.

TABLE 1. Lentil meal recipe.

Ingredient	gm
Dehulled Lentil	100
Fresh tomato	20
Fresh onion	7
Fresh yellow carrot	20
Fresh garlic	3
Salt	4
Cumin powder	5
Water	100

TABLE 2. Bissarah meal recipe.

Ingredient	gm
Dehulled crushed broad bean	100
Fresh onion	10
Fresh tomato	15
Dried jew's mallow powder	5
Fresh garlic	3
Black pepper powder	0.5
Coriander powder	2
Salt	4
Water	100

Chemical analysis

Proximate chemical composition

Moisture, lipids, ash, fiber and protein were determined according to AOAC methods (2000). Nitrogen free extract NFE (Carbohydrates) was calculated by difference using the following equation.

NFE (%) = 100 – (% Moisture + Protein + Fat + Ash + Fiber).

Caloric values

Caloric values of the prepared products (Lentil and Bissarah) were calculated according to the method suggested by Dougherty et al. (1988). Energy (E) equals calories per 100 g product were calculated using the following equation:

$E_{kcal/100g}$ = 4 (protein % + nitrogen free extract %) + fat% x 9

Determination of minerals

Sample preparation

About of 0.2 – 0.3 g of ground sample was weighed into the polytetrafluoroethylene digestion vessel add 5 mL of concentrated HNO_3 and 2 mL of hydrogen peroxide (H_2O_2). Subsequently, the digestion of samples is carried out on a two-step temperature program. The temperature increased until 190°, cover 10 min in the first step. During the second step, the temperature was maintained at 190 °C for 30 min. After digestion, must cool the solution and evaporated to 2 mL and diluted with deionized water in a 50-mL volumetric flask for the Atomic Absorption Spectroscopy analysis. Obtained results as the average of three repeated measurements, as well, all digestions were performed in triplicate.

Instruments

An Agilent atomic absorption spectrometer equipped with Agilent single-element hollow cathode lamps and a 10-cm air–acetylene burner was used for the determination of the metal ions.

Determination of amino acids

Determination of amino acids by the method described by Spackman et al. (1963).

Determination of total phenolic conents (TPC)

Extraction

The TPC in samples, 10 g of each defatted powdered samplewere extracted individually at room temperature (~25 ºC) with 100 mL absolutemethanol. Filter the extracts through filter paper Whatman No 1 using rotary evaporator at 45 ± 5º C to evaporate the solvents, and the driedmatter was storage at -20 ºC for further determinations.

Quantification and identification of phenolic contents

TPC in the extracts were determined by the FolinCiocalteu method according to Singleton and Rossi (1965).

The separation of phenolic acids and flavonoids were performed with an Agilent 1260 Infinity series HPLC according to Hakkinen et al. (1998).

Determination of antioxidant activity

Measuring the DPPH radical in the extract by the method explained by Brand-Williams et al., (1995). An aliquot of 0.1 ml of the extracted fraction was mixed with 3.9 ml of freshly prepared DPPH in a concentration of 60 µ mols in methanol. After 30 min. incubation at ambient temperaturein the dark, the resultant absorbance was measured at 515nm. All determinations were performed in triplicate. The percentages of inhibition of the DPPH radical were calculated by the following equation :

$$\% \text{ Inhibition} = A_{co} - A_{At} \backslash A_{co} \text{ X } 100$$

Where : A_{co}: the control absorbance at t = 0.
A_{At} : the samples absorbance at t = 30 mm.

All the antioxidants needed to reduce the DPPH radical concentration by 50 % (IC_{50}), and the antiradical power (ARP), were calculated which equals 1/ IC_{50}.

Phytic acidcontent

The determination of phytic acidcontent in samples as antinutation factors was performed by the method explained by Haug and Lantszch (1983). Samples with solution of acidic ammonium iron-III sulphate (known concentration).were heated Using 2, 2 bipyridine at wavelength 519_{nm} through spectrophotometer.

Determination of aflatoxin

aflatoxin was determinated by measuring on Agilent Technologies 1260 series HPLC with UV detection as explained by Makun et al., (2012).

Microbiological Examination

The experimental samples of dried Lentil soup and Bissarah were analyzed for the following microbial counts : mesophilic, thermophilic, coliform group, yeast and moulds,were determined according APHA (1992). At regular intervals a microbiological analysis was performed for 6 months of storage.

Sensory evaluation

The rehydrated soup samples were sensory evaluated after dissolving in hot water (10 g dried soup mixtures / 65 ml of water) the sensory properties, were i.e. taste, flavor, thickness, color, Trend to separation and overall acceptability. The assessment was carried out by 10 panelists of the Food Science and Technology Department, Faculty of Agriculture, Fayoum University according to Kramer and Twigg (1974).The numerical scale was: Excellent ≥ 8.5; very good 7-8.4; good 6-6.9; fair 5-5.9; poor 4-4.9 and very poor ≤ 3.9. Analyzed statistically the data obtained from sensory evaluation by ANOVA (Snedecorand Cochran, 1980).

Results and Discussion

Proximate chemical composition

Pulse crops including Lentil and broad beans are an excellent source of protein, carbohydrates, and fiber. They provide many essential vitamins and minerals. The major chemical composition of the investigated main raw materials and their final products are given in Table 3. The data show that the unprocessed materials, Lentil and broad bean had higher moisture content (10.57 and 11.33%) compared to the end products, dried Lentil soup (7.59%) and Bissarah (6.63%). These results are in accordance with that of Egyptian Standard (2003) demonstrating that moisture content of dehydrated bouillons must not exceed 6%. Results presented in Table 3 indicate that the Lentil and Lentil soup had highest protein content (27.38 and 23.15 %) compared to broad bean and Bissarah, (24.07 and 21.75 %). The obtained results are in harmony with that detected by (Hayat et al., 2014).

TABLE 3. Proximate chemical composition of lentil, broad bean and their products.

Component (%)	Investigated samples			
	Lentil	Dried Lentil Soup	Broad Bean	Dried Bissarah
Moisture	10.57±0.99	7.59±0.92	11.33±1.24	6.63±1.36
Crude protein	27.83±2.25	23.15±3.52	24.07±2.90	21.75±4.42
Crude lipids	1.02±0.86	0.78±0.28	1.42±1.25	1.06±0.81
Crude fiber	2.18±1.69	3.27±1.54	2.67±1.21	3.87±1.55
Ash	2.56±1.27	5.11±1.38	3.26±1.01	5.34±1.52
Nitrogen Free Extract	66.41	67.69	68.58	67.98
Total caloric energy (K_{cal}/100 g)	386.14	370.38	383.38	368.46

Crude fiber of the investigated samples, shown in Table 3 clearly indicated that the values of crude fiber were 2.18 and 3.27% for lentil and dried lentil soup respectively. While Broad bean and dried Bissarah have values of 2.67 and 3.87%, respectively. The end products had fiber content higher than the raw materials may be due to added fiber-rich vegetables.

Nitrogen free extract as carbohydrates calculated by difference in the tested samples, values obtained showed the samples contain nearest values of carbohydrates. Such finding coincides with that obtained by El-Wakeel (2007) who found that the carbohydrate of Lentil was 66.41%.

It can be concluded that from the chemical analysis the samples examined contain responsible contents of the required nutrients especially protein and carbohydrates as a source of energy needed by adults and children. So, the total energy value of both Lentil soup and Bissarah being (370.8 and 383.38 k_{cal} / 100 g) respectively.

Mineral elements content

The mineral contents calculated as mg/100g on dry basis of the dried Lentil soup and Bissarah are illustrated in Table 4. The dried Lentil soup had the maximum levels of the elements content compared to Bissarah. Potassium is the most predominated elements with values of 797.0 mg/100g for dried Lentil soup and 546.0 mg/100g for Bissarah.

Dried Lentil soup had medium amounts of phosphorus, magnesium and calcium; the values were 263, 207 and 128 mg/100g, respectively. While dried Bissarah had values of 185, 94.4 and 85 mg/100g for phosphorus, magnesium and calcium, respectively.

Meanwhile, the lowest values of elements for zinc was 3.7 and 2.4 mg/100g in dried Lentil soup and Bissarah, respectively. While iron had higher amounts compared to zinc (8.6 and 6.3 mg/100g) in dried Lentil soup and Bissarah respectively. These results revealed that Lentil soup and Bissarahmay be a source of minerals needed by the body.

Such finding coincides with that obtained by Iqbal et al. (2006) and Zia-Ul-Haq et al. (2011).

Amino acid composition

Legume seeds have high amount of proteins and consequently amino acids. The value of food products is assessed by the amounts of essential amino acids. Amino acids composition expressed in (g amino acid / 16 g nitrogen) of dried Lentil soup and dried Bissarah was determined and the obtained results are given in Table 5.

As for essential amino acids, data given in Table 5 shows that arginine, lysine and leucine were found in high level in dried Lentil soups (6.94, 6.2 and 5.19 g/16 g N) and Bissarah (7.94, 5.9 and 5.54g/16 g N) respectively. There are medium quantities of phenylaniline and valinein Lentil soup (4.1 and 4.92 g/16 g N) and Bissarah (4.87 and 3.91 g/16 g N) respectively. On the other hand, the results given in Table (5) shows that all of Lentil soup and Bissarah had lower quantities from methionine (0.75 and 0.61) and tryptophan (0.65 and 0.41 g/16 g N) respectively.

As for non-essential amino acids, glutamic and aspartic acids was the most predominated in Lentil soup (13.85 and 9.17 g/16 g N) and Bissarah (14.27 and 13.35 g/16 g N) respectively.

TABLE 4. Mineral elements content as (mg/100g) of dried Lentil soup and Besarahon dry basis.

Component	Dried Lentil soup	Dried Bissarah
Calcium	128.0±18.52	85.0±13.75
Magnesium	207.0±55.11	94.4±16.52
Potassium	797.0±104.01	546.0±57.16
Phosphorus	263.0±101.34	185.0±58.95
Zinc	3.7±1.08	2.4±1.00
Iron	8.6±1.57	6.3±2.07

TABLE 5. Amino acid composition of dried Lentil soup and dried Bissarah (g/16 g N).

Amino acid	Dried Lentil Soup	Dried Bissarah
Essential Amino Acid (EAA)		
Leucine	5.19	5.54
Isoleucine	2.12	2.38
Lysine	6.2	5.9
Methionine	0.75	0.61
Phenylaniline	4.13	4.87
Therionine	2.89	3.07
Tryptophan	0.65	0.41
Valine	4.92	3.91
Arginine	6.94	7.94
Histidine	1.8	2.75
Non-Essential Amino Acid (NEAA)		
Alanine	3.98	4.85
Aspartic acid	9.17	13.35
Cysteine	0.63	0.85
Glutamic acid	13.85	14.27
Glycine	2.98	7.34
Proline	3.12	3.35
Serine	5.73	6.04
Tyrosine	2.83	2.54

Also, from the aforementioned data it could be noticed that both of dried Lentil soup and Bissarah are rich in acidic amino acids (aspartic and glutamic), leucine, lysine, and arginine but poor in amino acids containing sulpher and tryptophan. These data are parallel to that achieved by by Swaminathan 1988 and Al-Tonny (2012).

Total phenolic compounds and antioxidant properties

The total phenolic content (TPC) in extracts of dried Lentil soup and Bissarah expressed as (mg gallic acid equivalent/g dry mass) and antioxidant activity expressed as $IC_{50,}$ and the antiradical power (ARP) the shown in Table 6.

From Table 6, it was clear that the Bissarah extract had the highest value of TPC (61.4 mg GAE/g), while Lentil soup extract had (50.04 mg GAE /g) of TPC. Regarding to antioxidant activity the obtained results show that the Bissarah extract had (1.3) ARP and (0.77) IC_{50} as compared to Lentil soup extract which had (0.83) ARP and (1.2) IC_{50}.

The higher the ARP, the lower the IC_{50} and vice versa because high ARP values indicate that high efficiency as antioxidants. The differences in antioxidant activity of phenolic compound is directly affected of chemical structures as the number and position of the attached hydroxyl groups and the degree of glycosylation with respect to Carboxyl functional group (Aguilera et al., 2011).

Generally, it could be concluded that dried Lentil soup and Bissarahcould be a rich source of effective antioxidants against fighting free radicals which are detrimental to human health.

TABLE 6. Total phenolic content and DPPH scavenging activity of Lentil soup and Bissarah.

Parameter	Lentil soup	Bissarah
Total phenols as gallic acid (mg/g)	50.04±7.17	61.40±10.25
IC_{50}*	1.2±0.27	0.77±0.23
ARP **	0.83±0.24	1.3±0.20

* The amount of antioxidant necessary to decrease the initial DPPH concentration by 50%.
** The antiradical power (**ARP**)

Individual phenolic compounds identification

Gallic acid, Pyrogallol, Resorcinol, Caffeic Acid, Vaniline, Salicylic acid, Cinnamic acid and Quarecetinas Individual phenolic identification in methanolic extract of Lentil soup and Bissarahwere recognized and the obtained results are presented in Table 7.

Gallic acid, Pyrogallol, Vanilline were detected to be the major phenolic components, values were 33.61, 32.51 and 31.07 mg/g, respectively in Bissarah extract. On the contrary, Gallic acid was detected to be the minor phenolic component in Lentil soup extract, the value was 4.84 mg/g. Pyrogallol was the predominant in Lentil soup extract, value about 39.17 mg/g. meanwhile, Vanilline was found to be absent in Lentil soup extract. Lentil soup had the highest values of Resorcinol and Cinnamic acid contributing about 50.81 and 13.44 mg/g compared to Bissarah extract which had 7.91 and 11.11 mg/g, respectively. But, Bissarah extract had the highest values of Salicylic acid and Quarecetin contributing about 23.53 and 19.88 mg/g compared to Lentil soup extract which had 8.68 and 7.59 mg/g, respectively.

This can be referred that Bissarah extract had high percentage of most studied phenolic components compared to Lentil soup.

Antinutritional factors in dried lentil soup andBissarah

Phytic acid is an ant-nutritional agent which, form complex with food minerals such as calcium, zinc, iron, and magnesium making it non-absorbable. Also linked to (proteases and alpha-amylase) as inhibit digestive enzymes (Angel et al., 2002 and Mudgil & Barak, 2013).

Data given in Table 8 show that raw broad bean had the highest content of phytic acid (16.43 mg/g) compared to raw Lentil seeds (2.93 mg/g). There was a decrease of this ratio in the final product and the decrease ratio was 89.41% and 84.30% in dried Bissarah and Lentil soup, respectively.

Our results are parallel with the results of (Vidal-Valverde et al., 1994) who suggested that cooking soaked lentil seeds in water led to complete removed to Trypsin inhibitor and reduced Phytic acid.

Legumes do not consume before conducting various treatments some of which are soaked, boiling, extrusion, autoclaving, germination, etc. These treatments showed inhibition or reduction of anti-nutritional factors such as tannins, trypsin inhibitor activity, phytic acids, hemagglutinin, ...etc (Abbas and Ahmed, 2018).

Keeping quality of dried Lentil soup and Bissarah during storage

The shelf life of the product is not fixed but may change depending on storage conditions. The most important of these conditions such as temperature, but other conditions such as package attributes, atmospheric humidity and exposure to light, may all be important for specific foods (Richardson, 1986).

Samples were stored in polyethylene bags for six months at room temperature, and analyzed at regular intervals every two months, for chemical composition and microbiological count, results obtained in the Tables 9 and 10.

Changes in chemical composition during srtorage

Data presented in Table 9 show that the moisture content of the samples increased slightly during the storage period, but this increase is still in the safe side.

Moisture content of Lentil soup increased slightly from 7.56 at the beginning of storage to 7.84 at the end of storage at room temperature. The same trend it was noticed in Bissarah, moisture content increased from 6.63 at the beginning of storage to 7.22 after 6 months of storage.

TABLE 7. Phenolic components content of Lentil and Bissarah extracts expressed as (mg/g dry mass).

Component	Concentration (mg / g)	
	Lentil soup	Bissarah
Gallic acid	4.84	33.61
Pyrogallol	39.17	32.51
Resorcinol	20.81	7.91
Caffeic Acid	nd	nd*
Vaniline	nd	31.07
Salicylic acid	8.68	23.53
Cinnamic acid	13.44	11.11
Quarecetin	7.59	19.88

nd*: not detected.

TABLE 8. Antinutritional factors in lentil, dried lentil soup, broad bean and Bissarah.

Reduction Rate	Dried Bissarah	Broad Bean	Reduction Rate	Dried lentil Soup	Lentil	Antinutrient
89.41	1.74±0.33	16.43±2.50	84.30	0.46±0.15	2.93±1.43	**Phytic acid (mg/g)**

TABLE 9. Changes in chemical composition of dried lentil soup and Bissarah during storage period.

Storage period (month)				Sample	Constituent (%)
6	4	2	0		
7.84±1.10	7.69±1.20	7.62±1.173	7.59±1.13	**Lentil soup**	**Moisture**
7.22±1.51	7.01±1.55	6.82±1.73	6.63±1.66	**Bissarah**	
23.25±3.450	23.18±3.480	23.17±3.490	23.15±3.50	**Lentil soup**	**Protein**
21.95±4.54	21.86±4.56	21.79±4.45	21.75±4.42	**Bissarah**	
0.83±0.29	0.81±0.29	0. 80±0.29	0.78±0.28	**Lentil soup**	**Fat**
1.18±0.71	1.15±0.74	1.13±0.75	1.06±0.81	**Bissarah**	
5.23±1.29	5.19±1.29	5.17±1.29	5.11±1.38	**Lentil soup**	**Ash**
5.52±1.32	5.43±1.42	5.38±1.47	5.34±1.52	**Bissarah**	
3.38±1.57	3.35±1.63	3.30±1.69	3.27±1.68	**Lentil soup**	**Fiber**
4.11±1.35	4.06±1.47	3.93±1.59	3.87±1.54	**Bissarah**	
59.47	59.78	59.94	60.1	**Lentil soup**	**N Free Extract**
60.02	60.49	60.95	60.35	**Bissarah**	

Concerning the protein, fat, ash and fiber contents there is no a remarkable changes in these chemical constituents in the both product approximately remained constant during 6 months ofstorage period may be due tothe control of storage conditions such as temperature and relative humidity.

Change in microbiological count during storage

The effect of storage period at room temperature on growth of microbial population of dried Lentil soup and dried Bissarah was studied and the obtained results are presented in Table 10.

Table 8 demonstrated that dried Lentil soup had higher total mesophilic aerobic bacteria count than Bissarah, which the count increased gradually with the prolongation of time. Where, dried lentil soup had total count increased from 2.1 x 10^3 in the beginning to 4.5 x 10^4 at the end of storage period. The same trend it was noticed for Bissarah, the total count increased from 8.3 x 10^2 cfu/g]\ at in the beginning to 3.7 x 10^3 after six months of storage.

The results of thermophilic bacteria count in both of dried Bissarah and Lentil soup less than 100 cfu/g during the storage period.

Also, regarding to yeast and mould, Lentil soup exhibited slightly higher mold and yeast count than Bissarah. It was obvious slightly increase in yeast and mould count in both of investigated samples with the prolongation of storage period. Coliform group was detected at a few numbers ranged from ndto 7 cfu/g in both investigated samples. Such finding coincides with that obtained by Al-Tonny (2012).

The low microbial count of dried Bissarah may be attributed to the low moisture content and the high total phenolic content which have antimicrobial effect such as phenolicacids, cinnamic acid (Nakajima et al. 2009 and Telles, et al., 2017).

The differences in microbiological count of these products may be due to the differences in type of the raw materials (vegetables and spices) used in processing these products.

From the aforementioned data it could be concluded that the obtained values of microbiological count of investigated products in this work was acceptable by Egyptian standards (2007).

Microbiological count of dried Lentil soup and Bissarah during storage period at room temperature

Total aflatoxins

Aflatoxin can be formed in dried foods such as spices as a result of fungal contamination before and after harvest.

Various Aflatoxins e.g., G_1, G_2, B_1, B_2 were detected in the studied samples and the results illustrated in Table 11.

The data presented in Table 11 show that Bissarah had the highest values of G_1, G_2, B_1, B_2 and total aflatoxins (0.68 ppb) compared to Lentil soup (0.20 ppb). The obtained values were very low than the recommended level (10 ppb) in the Egyptian Standards (2007).

Also, the Food and Drug Administration (FDA) has set maximum permissible levels of total aflatoxin in food at 20 ppb.

Aflatoxin B1 among the different aflatoxins, is predominant in the Bissarah sample contributing about 0.25 ppb followed by B_2 and G_1 contributing about 0.16 ppb for each one followed by G_2 contributing about 0.11 ppb. While aflatoxin G2 is predominant in lentils soup followed by G_1 contributing 0.07 ppb followed by aflatoxins B_1 and B_2 contributing about 0.02 ppb for each one.

The presence of aflatoxin in both dried Lentil soup and Bissarah may be due to spices found by Fazekas et al. (2005) that spices are usually contaminated with mycotoxins. Home cooking such as boiling and frying (approx. 150°C) failed to destroy aflatox in B_1 and G_1 in the solid state (Kamimura, 1989). Moreover, the type of food and aflatoxin also influenced the degree of inactivation achieved. Various heat treatment reduces aflatoxin by up to 50-95% (Reddy and Rani, 2004; Hussain et al., 2011) .

Sensory Evaluation of rehydrated lentil soup and dried Bissarah

Sensory assessment is a good way to solve problems associated with food acceptance. It is useful in improving product quality Singh-Ackbarali and Maharaj (2014).

Dry soup should have the required quality, represented by good flavor and acceptable taste. The end product should be free from unacceptable taste and ouder Abeysinghe and Illepruma (2006).

Rehydrated lentil soup and Bissarah Sensory evaluation according to taste, flavor, thickness, color, Trend to separation and overall acceptability of soup was determined the results illustrated in Table 12.

Table 12 demonstrated that both of the Lentil soup and Bissarah samples have high values of all the taste, flavor, thickness, color and trend to separation, in turn, the overall acceptability.

TABLE 10. Microbiological count of dried Lentil soup and Bissarah during storage period at room temperature.

Storage period (Month)	Products	Total count (cfu/g)	Thermo-philic (cfu/g)	Coliform group (cfu/g)	Yeast & mould (cfu/g)
0	Lentil Soup	$2.1 \times 10^3 \pm 0.763 \times 10^3$	29±10.5	nd	26±9.8
	Bissarah	$8.3 \times 10^2 \pm 0.153 \times 10^3$	26±6.24	nd	17±7.94
2	Lentil Soup	$2.6 \times 10^4 \pm 0.305 \times 10^4$	35±13.22	4±2	31±13.23
	Bissarah	$2.8 \times 10^3 \pm 0.20 \times 10^3$	42±15.87	nd	23±7.93
4	Lentil Soup	$4.0 \times 10^4 \pm 0.17 \times 10^5$	38±13.22	7±3.60	35±10.15
	Bissarah	$3.3 \times 10^3 \pm 0.17 \times 10^4$	45±19.47	nd	34±10.53
6	Lentil Soup	$4.5 \times 10^4 \pm 0.13 \times 10^5$	58±13.75	nd	42±12.76
	Bissarah	$3.7 \times 10^3 \pm 0.12 \times 10^4$	49±19.67	5±2.65	39±10.14

TABLE 11. Aflatoxins in dried lentil soup and Bissarh.

Sample	Concentration (µg/kg)				
	G_1	G_2	B_1	B_2	Total Aflatoxin
Lentil Soup	0.07	0.09	0.02	0.02	0.20
Dried Bissarah	0.16	0.11	0.25	0.16	0.68

TABLE 12. Sensory evaluation of rehydrated lentil soup and Bissarah.

Sample	Taste (10)	Favor (10)	Thickness (10)	Color (10)	Trend to separation (10)	Overall Acceptability (50)
Lentil Soup	8.75±0.90	9.25±0.27	8.875±0.87	9.125 ±0.69	9.00±0.78	45.00
Bissarah	8.50±0.96	9.12±0.48	9.00±0.68	9.25±0.67	8.50±0.90	44.375

Conclusion

It can be concluded that the investigated products (dried Lentil soup and Bissarah) had responsible contents of the required nutrients to meet the requirements of human for minerals. Moreover, containing a good proportion of phenolic contents, which play an active role against the fight against free radicals that are harmful to human health.

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إنتاج وتقييم شوربة العدس والبيصارة المجففة

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نظرا لنمط الحياة الحديثة وإضطرار المرأة للخروج للعمل وعدم توفر وقت لربة المنزل لتجهيز الطعام لأفراد الأسرة بصورة دورية يوميا مما أدى فى الأونة الأخيرة الى ظهور العديد من الوجبات سابقة الطهى والتجهيز.

وقد إجريت هذه الدراسة بغرض إنتاج وتجهيزبعض الوجبات الشعبية البقولية (عدس - بيصارة) فى صورة وجبات سابقة الطهى مجهزة بصورة مجففة سريعة الذوبان يمكن تجهيزها من خلال استرجاعها خلال دقائق قليلة يمكن من خلالها تلبية احتياجات أفراد الأسرة العاملة خاصة الفئات محدودة الدخل كما يمكن استخدامها فى تغذية طلاب المدارس والمدن الجامعية والمستشفيات ورجال الشرطة والقوات المسلحة لما تتميز به من قيمة غذائية عالية بصورة رخيصة وخفة وزن وفترة صلاحية طويلة دون الحاجة لحفظها بالتبريد او التجميد.

وكانت أهم النتائج المتحصل عليها هي أنخفاض نسبة البروتين فى المنتجات المطهية المجففة مقارنة بنسبة البروتين فى المواد الخام الرئيسية الداخلة فى التصنيع بينما أرتفعت نسبة كل من الألياف والرماد نتيجة الأضافات الاخرى. و إحتواء كلا من منتجات العدس والبيصاره سابقة الطهى على نسبة عالية من العناصر المعدنية وكان البوتاسيوم هو العنصر السائد بنسب بلغت (٧٩٧ ، ٥٤٦ملجم لكل ١٠٠ جم) على التوالى.اما عنصرى الحديد والزنك وجدوا بكميات قليلة جدا مقارنة بالعناصر الاخــرى بنسب كانت (٨,٦ ، ٣,٧ ملجم لكل ١٠٠ جم) ، (٦,٣ ، ٢,٤ ملجم لكل ١٠٠ جم) فى كل من العدس والبيصاره على التوالى.

أظهرت نتائج التحليل الكروماتوجرافى فائق الأداء لفصل وتقدير محتوى المنتجات من الأحماض الأمينية .أن الأحماض الأمينية الأساسية السائدة (الليسين ، الليوسين) فى كلا من منتجات العدس والبيصاره سابقة الطهى والتجفيف بينما وجد كلا من المثيونين والتربتوفان بكميات منخفضة قى كلا المنتجين. و بالنسبة للأحماض الأمينية الغير أساسية كان كلا من حامضي الجلوتاميك والأسبارتيك هما السائدان فى كلا المنتجين (العدس ، البيصاره).

كما وجد أن مستخلص البيصاره يحتوى على أعلى نسبة من الفينولات الكلية مقارنة بالعدس. وأظهرت نتائج التحليل الكروماتوجرافى فائق الاداء لفصل وتقدير كمية المركبات الفينولية فى المستخلص الكحولى لكل من العدس والبيصاره أن حامض الجاليك والبيروجالول والفانيلين كانت أكثر المركبات الفينولية السائدة فى البيصاره بينما كان البيروجالول هو المركب الفينولى السائد فى العدس.

أظهرت النتائج أحتواء الفول البلدى على محتوى عالى من حامض الفيتك كأحد العوامل المضادة للتغذية مقارنة بالعدس وقد أدت عمليتى الطهى والتجفيف الى خفض هذا المحتوى بنسبة (٨٩,٤١ ، ٨٤,٣ ٪) على التوالى.

لوحظ من خلال دراسة تأثير أحتفاظ المنتجات المصنعة بجودتها من خلال التخزين على درجة حرارة الغرفة لمدة ٦ شهور أرتفاع طفيف فى المحتوى الرطوبى ولم يلاحظ تغيير ملحوظ فى بقية المكونات (البروتين – الدهن – الرماد – الألياف) للعينات المجففه مع طول فترة التخزين مما يعنى ثبات وأحتفاظ هذه المنتجات بجودتها خلال فترة تخزينها على درجة حرارة الغرفة.وأظهرت نتائج الفحص الميكروبيولوجى أرتفاع عدد الميكروبات المحبة لدرجة الحرارة المتوسطة فى العدس عن البيصاره وازدادت هذه الاعداد بزيادة فترة التخزين فى كلا من العدس والبيصاره وكانت في الحدود المسموح بيها.

أظهرت نتائج التقييم الحسى للمنتجات بعد استرجاعها وتحضيرها فى صورتها النهائية حصولها على درجات عالية (ممتازة) فى مقاييس اللون ، الرائحة ، الطعم ، القوام ، الميل للأنفصال.

مما سبق يمكن القول انها منتجات عالية الثبات والأحتفاظ بقيمتها الغذائية خلال فترة تخزينها على درجة حرارة الغرفة دون الحاجة لوسائل حفظ اخرى. وانها ذات قيمة غذائية كبيرة للمستهلك نظرا لأرتفاع محتواها من البروتين الغنى بالأحماض الأمينية الضرورية والكربوهيدات كمصادر للطاقة اللازمة للبالغين والأطفال على حد السواء بجانب احتوائها على نسب عالية من العناصر المعدنية يمكنها ان تمد المستهلك بكميات كافية من إحياجاته من هذه العناصر المعدنية والضرورية للجسم. كما تعتبرمصدر جيد للمركبات الفينولية والتى من الممكن ان تكون ذات تاثير واقى من الأصول الحره التى قد تهاجم خلايا الجسم وتسبب العديد من المشاكل الصحية (طفرات – سرطان – هرم او شيخوخة مبكرة).