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PREPARATION AND EVALUATION OF SOME DRIED VEGETABLE SOUP MIXTURES

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ABSTRACT

Dried vegetable soup mixtures are now widely produced for their long storage life at room temperature and in small unit volume. In addition, they are produced from different raw materials most of which are not available all the year around. Vegetable soup mixtures containing 75–95% air-dried vegetables such as carrots, spinach, onion, potatoes, peas, green beans, tomatoes, celery, garlic, squash and artichoke, in the form of pieces having a substantially intact cellular structure, were prepared. Citrate, lentil seeds, cumin, black-pepper, spices and salt were also added, packed in polyethylene bags, then stored for 6 months at ambient temperature. Moisture content and physico-chemical properties were determined during storage and the prepared vegetable soup mixtures after reconstitution were evaluated organoleptically.

Keywords: Dried soup, Vegetables, Chemical composition, Microbiological counts, Sensory evaluation, Reconstitution, Storage.

INTRODUCTION

Large quantities of fresh vegetables which their utilization in food processing became very important. Therefore, some vegetables such as carrots, squash, tomatoes, potatoes, spinach, artichoke, celery, onion, garlic and legumes such as lentil, peas and green beans are utilized and formulated without animal protein sources in different formulas for the production of fresh and dried vegetable soup mixtures. These fresh and dried vegetable soups mixtures were evaluated physically, chemically, microbiologically and organoleptically (Ibrahim *et al.,* 1989). The advantages of pre-cooked soup products have been discussed in previous work (Osman *et al.,* 1991). Pre-cooked dried lentil soup was prepared for mixtures of lentil seeds, vegetables, cereals, spices and flavouring agents.

Gaafar *et al.,* (1972) found that dehydrated lentil soup contained 4.3-6.4% aqueous solution containing salts, sugars, protein hydrolysates and polyols followed by dehydration. This final product could be used in packet soup. Mattila *et al.,* (1991) found that automated monitoring of microbiological quality of heat-processed food by the resazurin reduction test was applied to microtitration plate incubator-fluorimeter technology. Appearance and disappearance of the fluorescing peak of resorufin was monitored on microtitration trays. Pasteurized or UHT-treated starch-based soup (vegetable, consisting of 20% w/v) particles (6.3% carrot, 2.6% parsnip and 11.1% peas and 6% starch) was used as the model food system. *Bacillus subtilis* spores (UHT treatment) and vegetative cells of *Enterococcus faecalis* (pasteurization) were inoculated into the soup before heat treatment at levels which resulted in some survival. Timing of appearance of max. fluorescence correlated with number of bacteria in pre-incubated samples.

Berkh *et al.,* (1980) found that contents of Cu, Zn, Pb and Sn were studied in peas, white cabbage, carrots, beets, potatoes, raspberries, strawberries, canned vegetables, soups, jams, compotes and juices using polarography. Results were as follows in (mg/kg): Cu, 1.05-3.64; Zn, 1.30-9.56; Pb, 0.11-0.21. No Sn was found in the raw materials but it adhered in some finished products. Contents of Cu, Zn and Pb were corresponded to those in the raw materials.

Dashti *et al.,* (2001) found that proximate composition and phytate contents were determined in 32 Kuwaiti dishes (fish – based dishes, salads, pastries, desserts, meat, sandwiches, kuba dishes (meatballs), soup, youghurt, cheese). Percentage of fat content ranged from 0.99% (vegetable soup) to 29.28% (rahash; traditional dessert), protein content was lowest in vegetable soup (1.19%) and highest in fried fish (21.0%).

The aim of this study was to prepare some of dried vegetable soup mixtures from available local materials reasonable for Egyptian food habits.The prepared vegetable soup mixtures were chemically, microbiologically and sensory evaluated. In addition, changes occurred in the product were followed for six months of storage at room temperature.

MATERIALS AND METHODS

Materials:-

1- Vegetables: Fresh vegetables such as carrots, tomatoes, spinach, onion, potatoes, parsley, garlic, celery, squash, in addition to peas, green beans and lentil seeds (as a source of plant proteins) were obtained from El-Abour market.
2- Spices, cumin black peppers, sodium chloride and citric acid were purchased from the local private sector.
3- Commercial dried vegetable soup was used as a control.

Methods:-

1-Technological processes

I-Preparation of soup formulas.

Three formulas were used as shown in Table (1). All vegetables were washed and cut into small pieces before use. Ingredients were mixed together, cooked for 30 min. at 100°C, then blended.

II- **Lentil seeds** were soaked in tap water to remove dust, light husks and other foreign impurities. This process was repeated several times until clean lentil seeds were obtained. Lentil seeds were well cooked for 30 minutes in boiling water.

III- **Dehydration.** The cooked raw materials were dried in an air at 55±5°C for 8 hrs. A soup powder was obtained by grinding the dried materials in a waring blendor for 3 min., and the soup mixtures was filled in polyethelene pags then stored at room temperature for a period of 6 months.

2- Physical properties.

a) Rehydration test was carried out according to the method described by Ranganna (1977)

b) Drying ratio was determined according to the method described in El-Gendy (1981)

3-Sensory evaluation:

Ten panelists were asked to evaluate the dried vegetable soup mixtures after rehydration. Sensory evaluation was carried out according to the procedure described by Ranganna (1977)

4- Chemical analysis

a) Moisture, protein, reducing sugars, total sugars, ash, fiber and ascorbic acid contents were determined according to methods described inA.O.A.C (1995)

b) Minerals contents were determined in the ash according to the method described by Farag *et al.*, (1980)

5-Microbiological test:

Dried vegetable soup mixes was analysed for total count and coliform according to methods in A.O.A.C (1995).

6- Statistical method:

The obtained results were statistically analyzed according to Steel and Toorie (1980)

Table (1):Three soup formulas were prepared as follows according to Ibrahim *et al.*, (1989)

Ingredients (gm) used in soup preparation	Soup formula No. I	Soup formula No. II	Soup formula No. III
Carrots	250	250	250
Tomatoes	150	-----	-----
Spinach	250	-----	-----
Potatos	-----	250	-----
Squash	250	-----	250
Artichoke	-----	-----	250
Parsley	-----	3	3
Celery	-----	3	3
Peas	-----	250	-----
Green beans	-----	-----	250
Lentil	100	-----	-----
Onion	50	50	50
Garlic	25	25	25
Black-pepper	2	2	-----
Spices	-----	3	3
Cumin	2	-----	-----
Salt	3	3	3
Citric acid	3	3	3
water	500	500	500

RESULTS AND DISCUSSION

1- Chemical composition of fresh vegetable soup mixtures.

Data in Table (2) show the chemical constituents of each of fresh and dried vegetable soup mixtures.

The three fresh vegetables soup mixtures contained 2.54, 2.65 and 2.59% total proteins, respectively. Total sugars content were 1.40, 130 and 1.22%, respectively. This means that the second formula contained higher amount of protein and ascorbic acid while the first one contained higher amount of total sugars, ash and fiber. These differences could be due to the difference in the raw materials used.

These results are in agreement with those of Mattila *et al.*, (1991), Flynn and Fox (1981), Osman *et al.*, (1991) and Forde and Delahunty (2002).

Table (2): Chemical composition of fresh vegetable soup mixtures.

Chemical constituents	Formula No. I	Formula No. II	Formula No. III
Moisture content %	86.43	82.50	84.37
Protein content %	2.54	2.65	2.59
Reducing sugars %	1.07	1.00	0.93
Non-reducing sugars %	0.33	0.30	0.29
Total sugars %	1.40	1.30	1.22
Ash content %	0.95	0.84	0.82
Fiber content %	1.92	1.77	1.71
Ascorbic acid (mg/100g)	21.2	32.4	27.8

2- Physical properties of fresh vegetable soup mixtures.

The physical properties of vegetable soup mixtures as affected by dehydration process were also studied.

Data in Table (3) show that the drying ratio for the three vegetable soups mixtures were 1:5.9, 1:5.4 and 1:5.7. These differences in drying ratio could be due to the differences in raw materials.

Concerning water absorption value (after soaking in hot water for 10 minutes), results reveal that the first and the third formulas had almost the same value, i.e. 560.3 and 550.8 gms., compared to the second formula, i.e. 610.2 gms.

These results could be due to the differences in the added ingredients in which the third one contained higher amounts of potatoes and peas (rich source for starch and protein) compared to the other formula. These results are in agreement with those Mattila *et al.*, (1991) and Nagib (1992).

Table (3) Physical properties of fresh vegetable soup mixtures.

Physical properties	Fresh vegetable soup mixtures		
	Formula No. I	Formula No. II	Formula No. III
Weight of fresh vegetable soup mixtures (g)	1085	842	1090
Weight of dry vegetable soup mixtures (g)	185	155	190
Weight of dehydration vegetable soup mixtures from 1 kg fresh (g)	170.0	184.5	174.3
Time of drying (hours)	8	8	8
Drying ratio	1:5.9	1:5.4	1:5.7
Rehydration of 100 gm dehydrated soup mixes in hot water after 10 min (on dry weight basis) (g)	560.3	610.2	550.8

3- Chemical composition of dried vegetable soup mixtures.

The chemical composition after drying the vegetable soup mixtures are shown in Table (4). Dehydration lowered slightly the contents of protein, sugars and ascorbic acid.

These results are in agreement with those found by Flynn and Fox (1981) Ibrahim *et al.*, (1989), Osman *et al.*, (1991) and Nagib *et al.*, (2003).

Table (4):Chemical composition of dried vegetable soup mixtures (on dry weight basis).

Chemical constituents	Dried vegetable soup mixes formulae		
	Formula No. I	Formula No. II	Formula No. III
Moisture content %	6.78	5.43	6.14
Protein content %	18.20	14.35	15.04
Reducing sugars%	14.57	13.12	12.80
Non-reducing sugars%	3.86	4.38	3.50
Total sugars%	18.43	17.50	16.30
Ash content %	5.30	5.11	5.09
Fiber content %	11.22	11.08	10.83
Ascorbic acid (mg/100g)	120.14	230.40	170.35

Minerals contents of the prepared fresh and dried vegetable soup mixtures are given in Table (5). Results show differences in Ca content between the first, second and third formulas, i.e. 29.30, 24.70 and 17.80 mg/100g.

The first fresh formula showed higher content of Fe (25.70 mg/100g) as compared with that of the second and the third one in

which it was 17.30 and 20.14 mg/100g. On the other hand, results showed no differences in Zn, K and Cu content between the first, second and third formulas, i.e. Zn 8.30, 7.4 and 7.50 mg/100g respectively. Also K content were 470.50, 450.40 and 438.93 mg/100g in the three formulas, respectively. While, Cu contents were 5.70, 5.90 and 5.71 mg/100g in the three soup formulae, respectively.

The first fresh formula showed a higher content of Mg and Mn; being 190.30 and 9.40 mg/100g as compared to the second and the third formulas being 170.40, 175.40 and 7.80, 6.75 mg/100g, respectively.

Results also showed that dehydration greatly affected the amount of minerals, in the three vegetable soup mixtures. These results are in agreement with Eisenberger *et al.*, (1981), Danfors (1985), Berkh *et al.*, (1980) and Osman *et al.*, (1991).

Table (5): Minerals contents of fresh and dried vegetable soup mixtures (on dry weight basis).

Minerals mg/100g	Dried vegetable soup mixtures					
	Formula No. I		Formula No. II		Formula No. III	
	Fresh	Dry	Fresh	Dry	Fresh	dry
Ca	29.30	17.80	24.70	14.35	17.80	12.30
Fe	25.70	17.50	17.30	11.94	20.14	14.71
Zn	8.30	4.70	7.40	3.91	7.50	3.87
K	470.50	110.40	450.40	180.60	438.93	120.42
Cu	5.70	4.15	5.90	4.17	5.71	3.95
Mg	190.30	75.40	170.40	60.84	175.40	65.87
Mn	9.40	6.20	7.80	5.60	6.75	4.80

Fresh and dried vegetable soup mixtures were examined microbiologically at intervals during 6 months of storage at room temperature. Thus, total count and coliform bacteria were carried out in stored samples. As shown in Table (6), it is clear that fresh and dried vegetable soup mixtures were free from coliform bacteria at all periods of storage (6 months). Concerning the initial total count, in fresh samples being about 1300, 1100 and 980 cells/1gm, respectively. The microbial total count decreased gradually with the increase in storage period to reach the number of 370, 340 and 310 cells/gm at the end of storage in the three samples, respectively. Frazier and Westhoff (1978) reported that, during storage of dried food a slight decrease occurred in the numbers of organisms. These results are in accordance with those obtained by Silliker *et al.*, (1980), Nagib (1992), Mattila *et al.*, (1991), Wirtanen *et al.*, (1991), Gola *et al.*, (1990) and Osman *et al.*, (1991).

Table (6): Microbial changes in fresh and dried vegetable soup mixtures during storage for six months.

Samples	Total count cell/1 gm			Coliform cell/ 1 gm		
1-Fresh						
Soup formulae No. I	1300			-----		
Soup formulae No. II	1100			-----		
Soup formulae No. III	980			-----		
2-After drying	Storage period in months					
	0	3	6	0	3	6
Soup formulae No. I	630	400	370	-----	-----	-----
Soup formulae No. II	590	380	340	-----	-----	-----
Soup formulae No. III	540	340	310	-----	-----	-----

4- Effect storage on the chemical properties of dried vegetables soup mixtures.

Table (7) shows the effect of storage for six months at room temperature on the chemical properties of dried vegetable soup mixtures packed in polyethylene pouches .The moisture content of soup mixtures slightly increased gradually up to 6 months. This increase might due to the absorption of the atmospheric moisture during storage time. Also, reducing sugars slightly increased in all dried vegetable soup mixtures, while the non-reducing sugars and total sugars were slightly decreased in all dried vegetable soup mixtures during storage up to 6 months at ambient temperature.

Table (7): Effect of storage period at room temperature on the chemical properties of dried vegetable soup mixtures (on dry weight basis).

Component	Formula No. I			Formula No. II			Formula No.III		
	Storage period (months)								
	0	3	6	0	3	6	0	3	6
Moisture content %	6.78	6.90	7.04	5.43	5.60	5.81	6.14	6.30	6.70
Protein content %	18.20	18.11	18.02	14.35	14.30	14.22	15.04	14.99	14.87
Reducing sugars %	14.57	14.60	14.71	13.12	13.18	13.22	12.80	12.90	12.97
Non-reducing sugars%	3.86	3.79	3.59	4.38	4.24	4.15	3.50	3.32	3.18
Total sugars %	18.43	18.39	18.30	17.50	17.42	17.37	16.30	16.22	16.15
Ash content %	5.30	5.27	5.23	5.11	5.09	5.02	5.09	5.02	4.98
Fiber content %	11.22	11.19	11.09	11.08	11.03	10.94	10.83	10.77	10.69
Ascorbic acid (mg/100g)	120.14	110.21	100.50	230.40	225.30	215.20	170.35	160.99	150.41

The increment in reducing sugars and decrement in the total and non-reducing sugars might be due to the inversion and/or decomposition into reducing sugars or more simple compounds during storage (Canellas *et al.*, 1993).

Ascorbic acid content was decreased during prolonged storage in polyethylene pouches at room temperature. The loss of ascorbic acid would be due to the oxidation of that vitamin during storage. These results are in agreement with Nogueira *et al.*, (1978), Kurata *et al.*, (1973) and Nagib *et al.*, (2003).

The crude fiber and ash contents decreased during storage of the formulation mixtures in polyethylene pouches at room temperature.

4.2. Sensory properties of dried vegetable soup mixtures during storage.

Results in Table (8) represent the sensory evaluation of dried vegetable soup mixtures during storage. Color as well as odor are important factors since they determine the consumer preference. Results in Table 8 showed that the best soup was of the formula No. 2, which had been given the highest score for all sensory parameters compared with the other soup mixtures. The mixtures of soup No. 1 attained a medium score.

Table (8)Sensory evaluation of dried vegetable soup mixtures during storage at room temperature.

Samples	Color		Taste		Odor		Overall acceptability	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
	Zero time							
Control	7.60	±0.84	6.6	±0.70	6.5	±0.52	20.7	±1.95
Formula No. I	8.27	±0.46	7.82	±0.41	8.1	±0.57	24.2	±1.03
Formula No. II	9.00	±0.47	8.64	±0.67	8.73	±0.65	26.4	±1.26
Formula No. III	7.70	±0.67	7.1	±0.57	7.4	±0.51	22.2	±1.32
	After 3 months							
Control	6.6	±0.84	5.6	±0.70	5.44	±0.53	17.33	±3.00
Formula No. I	7.3	±0.48	6.82	±0.40	7.11	±0.60	21.11	±1.05
Formula No. II	8.0	±0.47	7.7	±0.68	7.78	±0.67	23.56	±1.24
Formula No. III	6.7	±0.68	6.1	±0.57	6.44	±0.53	19.22	±1.39
	After 6 months							
Control	5.6	±0.84	4.8	±0.79	4.7	±0.67	15.1	±2.08
Formula No. I	6.3	±0.48	5.78	±0.44	6.1	±0.57	18.2	±1.03
Formula No. II	7.0	±0.47	6.50	±0.53	6.7	±0.67	20.2	±1.14
Formula No. III	5.5	±0.53	5.30	±0.82	5.4	±0.52	16.21	±1.32

SD = Standard deviation

The lowest score was for the soup mixtures No.3 compared with the control. Data in this table show significantly gradual decrease for all samples during storage. The results concerning the organoleptic properties were in agreement with those reported by Ibrahim *et al.,* (1989), Nagib (1992) and Moskowitz (2002).

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تحضير وتقييم بعض مخاليط شوربة الخضروات المجففة

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تـم فـي هـذا الـبحث تحضير مخاليط من شوربة الخضروات المجففة وتقيمها كميائياً وميكروبيولوجياً وحسياً ومدى ثبات هذة المخاليط أثناء التخزين على درجة حرارة الغرفة العادية. وأوضحت النتائج :

١- دل التركيب الكميائى على احتواء مخاليط شوربة الخضروات الطازجة الثلاثة على ٨٦,٤٣% ، ٨٢,٥٠ % ، ٨٤,٣٧ % رطوبة و ٢,٥٤ % ، ٢,٦٥ % ، ٢,٥٩ % بروتين و ١,٤٠ % ، ١,٣٠ % ، ١,٢٢ % كـربوهيدرات و ٠,٩٥ % ، ٠,٨٤ % ، ٠,٨٢ % رماد و ١,٩٢ % ، ١,٧٧ % ، ١,٧١ % الـياف بالإضـافة إلى فيتامين ج وكان التركيب الكميائى لهذة المخاليط الـثلاثة بعد لتجفيف كالاتى ٦,٧٨ % ، ٥,٤٣ % ، ٦,١٤ % رطوبة ، ١٨,٢٠ % ، ١٤,٣٥ % ، ١٥,٠٤ % بروتين و ١٨,٤٣ % ، ١٧,٥٠ % ، ١٦,٣٠ % كربوهيدرات و ٥,٣٠ % ، ٥,١١ % ، ٥,٠٩ % رماد و ١١,٢٢ % ، ١١,٠٨ % ، ١٠,٨٣ الياف بالإضافة إلى حدوث نقص في حامض الاسكوربيك والأملاح المعدنية نتيجة التجفيف.

٢- دل التقيـيم الميكروبيولوجـى على خلو مخاليط شوربة الخضروات الثلاثة الطازجة والمجففة وأثناء فترة التخزين من مجموعة الكوليفورم مع ظهور انخفاض في الأعداد الكلية بين المخاليط الثلاثة الطازجة وبعد تجفيفها كما لوحظ انخفاض تدريجي في الأعداد الكلية في المخاليط الثلاثة أثناء فترة التخزين.

٣- دل التقيـيم الحسي لمخاليط شوربة الخضروات الثلاثة المجففة أن العينة رقم (٢) أفضل عينة من حيث جميع الخواص يليها العينة رقم (١) ثم العينة رقم (٣) مقارنة بالكونترول

٤- دلـت التجارب التخزينية على قدرة مخاليط شوربة الخضروات المجففة في عبوات من البولى ايثلين على احتفاظها بخواصها الطبيعية والكميائية والحسية دون تغير يذكر عند تخزينها لمدة ٦ شهور على درجة حرارة الغرفة.

يتضح من ذلك أنة يمكن تحضير مخاليط من شوربة الخضروات المجففة سريعة التحضير من خضروات مختلفة رخيصة الثمن توفر جزء من الاحتياجات اليومية وذات صفات جودة عالية.