

GREEN SALADS AS A SOURCE OF VITAMINS AND MINERALS

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ABSTRACT

Fresh green salads are a popular food which consumed daily by different age stages of rich and poor people for their low price and high nutritive value .

So , this investigation was designed to find out the most nutritive different salad samples . Moreover ; find out the quantity of different salads which covered the daily requirements of vitamin A, vitamin C ; iron ; calcium ; phosphorus and zinc for different age stages .

The fresh salad samples which more or less covered the daily requirements of vitamin A, vitamin C ; iron ; calcium ; phosphorus and zinc for all age stages in case that these salads were the only source of such components in daily diet can be arranged in the following descending order :

First sample: contains tomatoes , cucumber ; red pepper ; green mint ; garden rocket ; parsley ; green onion ; dried shamy bread ; olive oil ; black olives ; black pepper ; lemon juice ; salt and vinegar .

Second sample: contains tomatoes ; red pepper ; parsley , garlic ; green onion ; olive oil ; lemon juice ; boiled chick pea and salt .

INTRODUCTION

Fresh green salads are a popular food which consumed daily by different age stages of rich and poor people for their low price . In spite of the cheap price of these salads ; they had high nutritive value for their content of high concentration vitamin A ; vitamin C ; iron ; calcium ; phosphorus and zinc .

Souci *et al.* (1989) investigated the chemical components of raw tomatoes (*Lycopersicon esculentum*) and found that crude protein, fat, calcium, iron, vitamin C and vitamin A were 0.9 g ; 0.2 g ; 7-15 mg ; 0.5 mg ; 18-25 mg/100 g and 700-900 I.U./100 g respectively.

Bradley (1972) reported that, vitamin A and ascorbic acid of cucumber (*Cucumis sativus*) were ranged between 250 - 300 I.U./100 g and 7-11 mg/100 g (on fresh weight).

The chemical components of raw cucumber (*Cucumis sativus*), calcium, phosphorus, iron and zinc were ranged between 25-30, 24-27, 0.2-0.5, and 1.0-1.5 mg/100 g respectively as reported by Church and Church (1975).

The content of Fe in carrots ranged between 0.7-0.85 mg/100 g ; Ca 30-40 mg/100 g ; P 35-37 mg/100 g and zinc 0.35-1.00 mg/100 g (on fresh weight) as reported by Church and Church (1975).

Bressani (1983) mentioned that, the amount of vitamin A in carrots ranged between 10000-11000 I.U./100 g fresh weight, while the content of vitamin C ranged between 8-10 mg/100 g fresh weight.

The chemical components of (*Capsicum annuum* CV. grossum) protein, fat, calcium, iron, vitamin A and ascorbic acid were ranged between 0.8-1.00, 0.4-0.5 g/100 g; 6-9, 1.2-1.5 mg/100 g, 630-1770 I.U./100 g and 100-130 mg/100 g respectively [on fresh weight] by West *et al.* (1988).

Church and Church (1975) reported that, the amounts of phosphorus, calcium, iron and zinc in green mint were 82, 200, 79 mg/100 g and 1.5 mg/100 g respectively (on fresh weight).

Bressani (1983) found that, the content of vitamin A in green mint (*Mentha viridis*) was ranged between 4000 – 4133 I.U./100 g while the content of vitamin C [ascorbic acid] was ranged between 30 - 40 mg/100 g [on fresh weight].

Bressani (1983) mentioned that, the chemical composition of garden rocket (*Eruca sativa*) includes calcium, iron, phosphorus, zinc, ascorbic acid and vitamin A which were ranged between 340-355, 18-20, 45-50, 0.1-0.3, 110-122 mg/100 g and 4450-4475 I.U./100 g respectively (on fresh weight).

Church and church (1975) reported that, the contents of vitamin A, ascorbic acid, calcium, phosphorus, iron and zinc in parsley were 8500 I.U./100 g; 172 mg/100 g; 203 mg/100 g; 63 mg/100 g; 6.2 mg/100 g and 1.5 mg/100 g respectively (on fresh weight).

Sweeney and Marsh (1970) mentioned that, the content of vitamin A and vitamin C (ascorbic acid) in lettuce (*Lactuca sativa*) was ranged between 1500-1900 I.U./100 g and was ranged between 18 - 20 mg/100 g, respectively (on fresh weight).

Haytowitz and Matthews (1984) found that, the content of calcium, phosphorus, iron and zinc in lettuce were ranged between 60-68, 20-28, 1.1-1.4 and 0.22-0.44 mg/100 g respectively (on fresh weight).

Youssef (1993) indicated that, the chemical components of green coriander (*Coriandrum sativum*) as follows: 85.8% moisture, 4.3% crude protein, 0.7% fat, 0.2% ash, 1.7% crude fiber, 7.3% carbohydrates, 4 mg/100 iron, 200 mg/100 g; calcium 72 mg/100 g phosphorus and 0.4 mg/100 g zinc (on fresh weight).

Youssef (1993) reported that, the content of vitamin A in raw coriander was 4800 I.U./100 g; while the content of vitamin C was 75 mg/100 g.

Harris and Karmas (1975) illustrated that, the contents of calcium, phosphorus, iron and zinc in Cabbage (*Brassica oleracea* CV. capitata) were ranged between 35 – 47, 23 – 29, 0.4 - 0.8 and 0.18 -0.4 mg/100 g respectively (on fresh weight).

Vitamin A content of raw cabbage and vitamin C was ranged between 150 - 400 I.U./100 g and was ranged between 45 - 50 mg/100 g respectively by Bressani (1983).

Ascorbic acid of garlic (*Allium sativum*) was ranged between 20 - 30 mg/100 g (on fresh weight) as reported by Bradley (1972).

Soliman *et al.* (1999) illustrated that; corresponding values for fresh garlic were 65.79% moisture, 0.50% ash, 0.10% Ca, 0.13% total P, 5.74 mg/100 g Fe, 1.52 mg/100 g Zn.

Church and church (1975) mentioned that, vitamin A content of fresh onion was 43.5 I.U./100 g and 9.5 mg/100 g vitamin C, while it was 2050 I.U./100 g and 34 mg/100 g vitamin C for green onion.

Ensminger *et al.* (1995) found that onion content of minerals were (mg/100 g fresh onion) ranged between 2.8 to 50.4 calcium; 7.8 to 60.9 phosphorus, 0.2 to 0.8 Fe and 0.06 to 0.3 Zn.

So, this investigation was designed to find out the most nutritive different salad samples. Moreover; find out the quantity of different salads which covered the daily requirements of vitamin A, vitamin C, iron, calcium, phosphorus and zinc for different age stages.

MATERIALS AND METHODS

Materials:

Vegetables:

Tomatoes; cucumber; carrots; green pepper; red pepper; green mint; garden rocket; parsley garlic and green onion were obtained from local market in Mansoura.

Additives:

Black pepper, salt, dried shamy bread, olive oil, lemon juice, black olives, vinegar, chick pea, thyme, and low salt cheese were purchased from local market in Mansoura.

Methods:

Preparation of salad samples:-

Salad samples with additives were prepared using some spices according to the following four formulas (Table 1):-

Chemical analysis :-

Moisture, ash, crude protein, crude fat, and fiber were determined according to A. O. A. C (1990), while total carbohydrates were calculated by subtracting the difference.

Samples were prepared for mineral determination, according to the method of A. O. A. C. (1990). Iron, Ca, Zn were determined following the methods of Pearson (1970), while P was determined according to Page (1982).

Carotenoids were determined according to the method described by Wettstein (1957). While ascorbic acid was determined by using the method of Ranganna (1979).

Organoleptic evaluation: The final formulated mixtures were sensory evaluated by panel tests (panelists) according to Notter *et al.* (1959).

Table (1): Formula of salad samples No. 1,2,3and 4.

Ingredients	No. (1) g/100 g sample	No. (2) g/100 g sample	No. (3) g/100 g sample	No. (4) g/100 g sample
Tomatoes (<i>Lycopersicon esculentum</i>)	18.18	20	24	27.27
Cucumber (<i>Cucumis sativus</i>)	13.64	-	20	13.64
Carrots (<i>Daucus carota</i>)	-	-	15	-
Red pepper (<i>Capsicum annuum</i>)	13.64	10	-	-
Green pepper (<i>Capsicum annuum</i>)	-	-	23	18.18
Green mint (<i>Mentha virids</i>)	2	-	-	-
Garden rocket (<i>Eruca sativa</i>)	13.64	-	-	-
Parsley (<i>Petroselinum crispum</i>)	13.64	15	-	-
Garlic (<i>Allium sativum</i>)	-	1.5	-	-
Green onion (<i>Allium cepa</i>)	13.64	15	10	13.64
Low salt cheese (Cheese feta)	-	-	-	18.18
Dried shamy bread	5.45	-	-	-
Thyme (<i>Thymus vulgaris L.</i>)	-	-	0.25	0.23
Olive oil	2.73	5	-	3.64
Black olives	2.27	-	5	4.54
Black pepper	0.09	-	0.25	0.23
Lemon juice	0.45	1.3	1.5	-
Boiled chick pea	-	32	-	-
Salt (Sodium chloride)	0.45	0.2	0.5	-
Vinegar	0.18	-	0.5	0.45
Total weight	100 g	100 g	100 g	100g

RESULTS AND DISCUSSION

Chemical composition of fresh salad samples:-

Fresh salad sample No. (1):

The data tabulated in Table (2) showed that sample No. (1) contained 85.26% moisture, 1.81% protein, 3.5% fat, 1.20% crude fiber, 0.98% ash and 7.25% carbohydrates. While the same table showed that fresh sample No. (1) contained 750 µg/100 g vitamin A and 50 mg/100 g vitamin C. The minerals content were 4.5, 95, 45 and 1.30 mg/100 g for iron, calcium, phosphorus and zinc respectively on fresh weight basis.

The high content of vitamin A and vitamin C of this sample may be due to that it contains of high percentages of tomatoes, red pepper, garden rocket, parsley and green onion which had high levels of vitamin A and vitamin C. These results agree with those found by Church and church (1975); Bressani (1983); West et al. (1988) and Souci et al. (1989)

Table (2): Gross chemical composition of salad samples.

Samples	Sample No. (1)		Sample No. (2)		Sample No. (3)		Sample No. (4)	
	F.W.B.	D.W.B	F.W.B.	D.W.B	F.W.B.	D.W.B	F.W.B.	D.W.B
Components								
Moisture %	85.26	-	76.00	-	90.5	-	81.6	-
Protein %	1.81	12.28	4.00	16.66	1.20	12.63	3.37	18.32
Fat %	3.50	23.74	5.90	24.58	1.50	15.80	8.65	47.01
Fiber %	1.20	8.14	2.90	12.08	1.00	10.53	0.80	4.35
Ash %	0.98	6.65	0.90	3.75	0.95	10.00	1.40	7.61
Carbohydrates %	7.25	49.18	10.3	42.92	4.85	51.05	4.18	22.71
Food Energy (K Cal)*	68.99	468.04	112.32	468	38.45	404.70	109.67	596.03
Vit. A (µg)*	750	5088.19	554	2308.33	900	9473.70	350	1902.17
Vit. C (mg)*	50	339.20	51	212.5	40	421.05	35	190.21
Fe (mg)*	4.5	30.53	2.40	10	2.0	21.05	2.10	11.41
Ca (mg)*	95	644.50	60	250	37	389.47	120	652.17
P (mg)*	45	305.29	81	337.50	28	294.74	85	461.95
Zn (mg)	1.30	8.82	1.1	4.58	1.00	10.53	1.20	6.52

* Values per 100 g edible portion F.W.B.: Fresh weight basis D.W.B.: Dry weight basis

On the other hand this sample had high content of different minerals [Fe, Ca, P, Zn]. This may be due to that the sample contained high percentages of garden rocket and parsley, which had high level of these minerals. These results go in parallel with those found by Church and church (1975) and Bressani (1983).

Fresh salad sample No. (2):

The data tabulated in Table (2) showed that fresh salad sample No. (2) contained 76% moisture, 4% protein, 5.90% fat, 2.90% crude fiber, 0.90% ash and 10.30% carbohydrates. While the same table showed that fresh sample contained 554 µg, 51 mg, 2.40 mg, 60 mg, 81 mg and 1.10 mg/100g sample of vitamin A, vitamin C, iron, calcium, phosphorus and zinc respectively.

The high content of vitamin A and vitamin C may be due to its content of high portions of tomatoes, red pepper, parsley and green onion which contained high level of vitamin A and vitamin C. These results are in accordance with those reported by Church and Church (1975), West *et al.* (1988) and Souci *et al.* (1989).

On the other hand this sample had high content of different minerals [Fe, Ca, P, Zn], this may be due to that the sample contained high levels of parsley, tomatoes and green onion which had high level of these minerals. These results are in agreement with those obtained by Church and church (1975); Souci *et al.* (1989) and Ensminger *et al.* (1995).

Fresh salad sample No. (3):

The chemical composition of fresh salad No. (3) were given in Table (2), results showed that the sample contained 90.50% moisture; 1.20% protein; 1.50% fat; 1.00% crude fiber; 0.95% ash and 4.85% carbohydrates. While the same data showed that fresh sample contained 900 µg/100 g vitamin A; 40 mg vitamin C; 2 mg iron; 37 mg calcium; 28 mg phosphorus and 1.00 mg zinc /100 g. sample.

The high amounts of vitamin A and vitamin C in this sample may be due to its content of high percent of tomatoes, carrots, green onion and green pepper which contained high levels of vitamin A and vitamin C. These results were coincide with those reported by Church and church. (1975); Bressani, (1983); West *et al.* (1988); Souci *et al.* (1989) and Ensminger *et al.* (1995).

Fresh salad sample No. (4):

Results in Table (2) showed that fresh salad sample No. (4) contained 81.60% moisture, 3.37% protein, 8.65% fat, 0.80% crude fiber, 1.40% ash and 4.18% carbohydrates. While the same data showed that fresh sample contained 350 µg/100 g vitamin A and 35 mg/100 g vitamin C; also the data showed that fresh sample contained 2.10, 120, 85 and 1.20 mg/100 g of iron, calcium, phosphorus and zinc respectively.

Such high quantity of calcium (120 mg/100 g) and phosphorus (85mg/100g) may be due to its content of tomatoes, cucumber and green onion which showed high level of calcium and phosphorus. These findings agree with those reported by Bradley (1972); Church and church (1975); Souci *et al.*, (1989) and Ensminger *et al.* (1995)

The data in table (3) showed that, the studied samples covered the daily requirements for all age stages from vitamin A ; vitamin C ;iron; calcium; phosphorus and zinc and can be arranged as the following descending order considering that the fresh salad samples were the only source of vitamin A; vitamin C and different studied minerals .

- 1- Eating 80 g from fresh salad sample No . (1) covered the daily requirements for vitamin A;114 %of vitamin C ; also eating 289 g. from this salad covered the daily require-ments of iron; 30.5%of calcium;14.5%of phosphorus and 34 % of zinc .
- 2- Consuming 108 g.from sample No .(2) covered the daily requirements of vitamin A and 156.5 % of vitamin C; also eating 542 g .from this salad covered the daily require-ments of iron ;36 % of calcium ; 49 % of phosphorus and 54% of Zinc .
- 3- Eating 67 g . from fresh salad No . (3) covered the daily requirments of vitamin A and 85 % of vitamin C . While eating 650 g. from the same fresh salad covered the daily requirements of iron ; 27%of calcium ; 20 % of phosphorus and 59% of zinc .
- 4- Eating 171 g . from salad sample No . (4) covered the daily requirements of vitamin A and 171% of vitamin C . While eating 619g . from this salad covered the daily requirements of iron;82.5%of calcium;58%of phosphorus and 67.5% of zinc .

Table (3): Quantities (g.) covering the daily requirements of vit.A, vit.C, Fe, Ca, P, and Zn for all age stages from different fresh salad samples.

Components	Sample No. (1)		Sample No. (2)		Sample No. (3)		Sample No. (4)		
	A	B	C	B	C	B	C	B	C
Vit. A μ g	600	750	80	554	108	900	67	350	171
Vit. C (mg)	35	50	70	51	69	40	87.5	35	100
Fe (mg)	13	4.50	289	2.40	542	2.00	650	2.10	619
Ca (mg)	900	95	947	60	500	37	2432	120	750
P (mg)	900	45	2000	81	1111	28	3214	85	1059
Zn (mg)	11	1.30	846	1.10	1000	1.00	1100	1.20	917

A: F.A.O./W.H.O. Pattern 1988 for average all age stages .

B: Values per 100 g fresh sample.

C: Quantities covering the daily requirements (g).

Organoleptic evaluation of the fresh salad samples :

Sensory evaluation of the formulated fresh salad mixtures is considered one of the main important test affecting the acceptability of the prepared fresh salads. The organoleptic characteristics of all formulas were carried out by to selected volunteer controllers.

Table (4) illustrated the values of appearance, texture; color; odor; flavor; taste and the overall acceptability of the formulated mixtures. Formula No.(2)and formula No. (4) showed the highest scores of appearance; color; odor and taste.

From the results in Table (4); it could be concluded that formula No. (2) and formula No. (4) showed the highest overall acceptability while the other salad samples were more or less highly enough accepted.

Table (4): Organoleptic characteristics of fresh salad samples.

Characteristics Samples	Appearance (20)	Texture (15)	Color (15)	Odor (15)	Flavor (15)	Taste (20)	Overall acceptability (100)
Sample No. (1)	17	13	13	13	12	18	86
Sample No. (2)	18	13	13.5	13	12.5	18	88
Sample No. (3)	18	13.5	13	12.5	11.5	15	83.5
Sample No. (4)	19	13	13.5	13.5	11.5	18	88.5

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السلطات الخضراء كمصدر للفتيامينات والمعادن .

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السلطات الخضراء الطازجة تعتبر غذاء شعبي تستهلكه يوميا الأعمار المختلفة من الأغنياء والفقراء لانخفاض سعرها وأنها ذات قيمة غذائية عالية ولذلك فقد صمم هذا البحث لتحديد السلطات المختلفة ذات القيمة الغذائية المرتفعة . بالإضافة لتحديد الكميات من السلطات المختلفة التي تغطي الاحتياجات اليومية من فيتامين A و فيتامين C و الحديد والكالسيوم والفوسفور والزنك .

وقد وجد أن عينات السلطة الخضراء تغطي الاحتياجات اليومية من فيتامين A و فيتامين C و الحديد والكالسيوم والفوسفور والزنك للأعمار المختلفة في حالة أن هذه السلطات هي المصدر الوحيد للمركبات المذكورة في الغذاء اليومي .

ويمكن ترتيبها بالطريقة التنازلية التالية :

العينة الأولى :

تتكون من الطماطم والخيار والفلل الأحمر والنعناع الأخضر والجرجير والبقدونس والبصل الأخضر والعيش الشامى المحمص وزيت الزيتون والزيتون الأسود والفلل الأسود وعصير الليمون والملح والخل .

العينة الثانية :

تتكون من الطماطم والفلل الأحمر والبقدونس والثوم والبصل الأخضر وزيت الزيتون وعصير الليمون والحمص الشامى المسلوق والملح .