J. Agric. Sci. Mansoura Univ., 32 (3): 2061 - 2070, 2007

CANNED BABY FOODS

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ABSTRACT

This investigation summarize the trials to produce canned baby foods from our local vegetables and fruit (carrot , pumpkin , sweet potato and orange) suitable for infants from 6 – 12 months beside mother feeding .

Twelve's blends from the above vegetables and fruit were mixed with levels (100 , 50 , 25 %) beside two types of biscuits (LUX and TIGER) and ascorbic acid .

The chemical composition of each blends were estimated to show the effect of each content on health during infant growth and its effect on preventing some infant disease .

The obtained data indicated that , the blends from 1 – 6 which contains a high value of pumpkin had the highest percentage of protein , vit A , vit C , phosphor , iron and zinc and also covered the daily requirement of these elements , but it had a deficiency that the protein content was a plant protein .The addition of LUX biscuits and ascorbic acid for blends 7,8,9 improve the quality and quantity of protein due to skim milk in biscuits and also increase the vit C content (80.968 ,86.248 , 77.963) mg respectively than in control blend . Also the addition of TIGER biscuits (which supported with vitamins and minerals and consist of soy beans) and orange juice to blends 10,11,12 increase the value contents of protein and vitamins comparison with control blend . The most of these blends was very useful to prevent some nutrient diseases like caloric deficiency , diarrhea , night blindness ,scurvy , anemia , dwarfism .

The storage of blends in refrigerator during (3,6 months) make a little effect on the total microbial count but there were safety to eat , all blends were free from coliform activity **.** The addition of biscuits and orange juice improve the organoleptic evaluation .This study was a guide line to establish a new infant food .

Keywords: Carrot , pumpkin , sweet potato , orange juice , biscuits , baby food blends , chemical composition , microbial analysis , sensory evaluation .

INTRODUCTION

Millions of children in developing counties are suffering from malnutrition as a result of poverty, lack of suitable food, incorrect knowledge in nutrition and superstition. It is during the rapidly growing period of infancy and early childhood that malnutrition is most marked resulting in a high morbidity and mortality.

The formulated weaning food should be able to provide at least 300-400 calories per 100 gram of mixture. It is essential that children be encouraged to consume at least 100 gm of food and that mothers be educated not to cut down quantity of the usual food given to children foods, special attention should be paid to the quality and amount of protein in the product.

Infants are the most vulnerable group who require special attention for their nutritive values particularly at weaning times. After six months of age the quantity of breast feeding milk supplied by the mother is insufficient to meet the energy and nutrient requirements of the growing infant. Consequently, the production of processed foods for infant and children has

expanded enormously during the last decades. Such foods must not be only nutritious and cheap, but also safe and acceptable to provision of FAO/WHO (1985) committee and the Egyptian Standards for weaning foods (Aly, 1994).

Baby foods are not recommend until the infant is 4 to 6 months old. Cereal grains were the first solid ingredient used in baby food because of their high iron, thiamin and calories content (Wurtman, 1982).

Therefore, the percent study was carried out to prepare high nutritional values canned soft cream infant foods from available locally vegetables rich in carotenoids and to evaluate the chemical nutrition and biological properties of these formulas before and after storage for six month.

So this work was carried out to cover the following topics **:-**

- Infant and children are practically vulnerable to nutrition deficiency in developing countries and advanced societies .
- Breast feeding by mothers is insufficient to meet the energy and nutrient requirements of growth for infant , so it is important to supply the feeding with processed fruit and vegetables .
- Most our baby foods are import from abroad and cost much money.
- Therefore this work was a trial to produce some blends from local fruits and vegetables as a tradition source for baby foods .
- In this contention the following details were studied :

1-Select some local vegetables (carrot , pumpkin , sweet potato) cheap and high in nutrients

2-Designs 12 blends consists of vegetables and fruit and some biscuits with different level contains and determined these blends in chemical composition and microbial analysis

3-Organoleptic evaluation these blends and evaluate these blends about recovering the daily requirements for infants .

On brief this study produce some canned baby food for infant from (6-12) months rich in vitamins especially in Vit A and Vit C easy and simple prepared for mothers .

MATERIALS AND METHODS

1. Materials

The raw materials which were used throughout the current studies for preparation the different baby food mixtures were :-

A:- fresh vegetables and fruit [Yellow carrots (*Daucus carrota*) (yc), Pumpkin (*Cucurbita pepo*) (Pu) ,Yellow sweet potato (Ipomoea batatas lam) (Ysp),Baladi orange (*Citrus sincuisis*) (Bo)].

All the above mentioned commodities were obtained from the local market at Mansoura market, Dakhlia, Egypt.

B:- Additives [biscuits No 1(Lux Biscuits) which contain (flour, sucrose, veg. shortening, high fructose or glucose, milk powder, raising agents, food flavours, vanillin- halal) was obtained from Bisco* Miser company, Cairo, Egypt , biscuits No. 2(Tiger Biscuits)which contain(wheat flour, milk ,Soya ,sugar ,palm oil , fructose ,corn starch , raising agent (ammonium hydrogen carbonate , sodium hydrogen carbonate) , skimmed milk powder ,whey powder , flavors , vanillin ,salt ,vitamins B1,B2,B5,B6,B12,citric acid) was

obtained from Eideta company, Cairo, Egypt. and Ascorbic acid pure from EL-Gomhoria company, Cairo, Egypt.

C:- Gerber baby food (control sample) which contain water, carrot, wheat flour, oat flour, potatoes, tomato paste and onion powder. This sample was obtained from Gerber Products company.

2. Methods

The following procedures were carried out as a preliminary steps towards preparing baby formulas.

2.1. Preparation of raw materials :

Fresh vegetables were thoroughly washed with tap water and peeled with stainless steel peeler. The remaining edible portions of the vegetables were blanched by adding the possible quantity boiling tap water (ratio between vegetables and water was 2:1) for 5-10 minutes.

Orange juice was extracted by a stainless steel screw press. The extracted juice was screened through a single layer of cheese cloth to remove seeds and peels.

The blanched vegetables were mixed together in the following percentage (see Table 3) and blended together in a warning blender for 2 min. For homogeny, after that the baby food mixtures were filled in jars then pasteurizing in autoclave at 121 ºC for 20 min.

Table (1) : The composition of baby foods formulas *:

Constituents / Blends No.	Carrot %	Pumpkin %	Sweet potato %	Biscuits %	Additives %
1	100	---	---	---	---
2	---	100	---	---	---
3	---	---	100	---	---
4	25	25	50	---	---
5	25	50	25	---	---
6	50	25	25	---	---
7	25	25	50	10% Bis No.1**	0.1% Ascorbic acid
8	25	50	25	10% Bis No.1**	0.1% Ascorbic acid
9	50	25	25	10% Bis No.1**	0.1% Ascorbic acid
10	25	25	50	10% Bis No.2***	0.1%orange juice
11	25	50	25	10 % Bis No.2***	0.1%orange juice
12	50	25	25	10% Bis No.2***	0.1%orange juice
13	Gerber baby food				

*** Each sample weight 100 gram. ** LUX Biscuits. *** TIGER Biscuits.**

2.2. Chemical analysis :

Moisture, crude protein, lipids, ash and crude fiber content, ascorbic acid , calcium, phosphorus ,iron and zinc content were determined according to the method described by A.O.A.C. (2000).Total carbohydrate was calculated by difference .Total calorific value were calculated according to Wilson *et al*. (1974) and Scleet (1990) .Carotenoids were determined by method described by Wartestein (1957).

2.3. Microbiological analysis :

The microbiological tests (total viable bacterial count and coliform bacterial counts) in the stored infant food formulas conducted according to the method described by A.O.A.C (2000).

2.4 Organoleptic test :

Organoleptic evaluation of reconstituted baby food formulas were determined by a taste panel comprised of the staff members according to the system used by Ramadan (1990). The obtained data were statistically analyzed.

2.5- Statistical analysis :

Data were subjected to analysis of variance and the least significant difference (LSD) at 5 % probability according to SAS.

RESULTS AND DISCUSSION

1. Chemical composition of the raw materials :

The data presented in Table (2), showed the composition of fresh raw materials used throughout the current study. It could be noticed that the fresh vegetables pumpkin and carrot contained highest percentage of moisture 91.60 % and 87.79%, respectively. While the sweet potato contained the lowest percentage of moisture 75.06 %.

These data agreed with Robinson and Decker (1997), they demonstrated that each 100 g fresh pumpkin fruit pulp contained 92 gm of moisture.

The highest percentage of crude protein was found in pumpkin 12.0 % followed by carrot 8.501 % and sweet potato 4.543 %, respectively.

These results agreed with Robinson and Decker (1997), who said that fresh pumpkin contained 1 gm of crude protein content.

Pumpkin had the lowest value of fat content 1.190 % followed by sweet potato 1.203 % and yellow carrot 1.556 %, respectively.

The obtained data were in agree with Manar (1991) who found that the crude fat content of raw carrots were 1.53 on dry weight basis, also Robinson and Decker (1997) demonstrated that pumpkin contained 0.1 gm crude lipid/100 gm fresh weight pulp, also, Gomma (2000) studied the chemical composition of dried pumpkin, and crude lipid content was 0.1 %.

From the same table, it might be clear that, the highest crude fiber contents belonged to both pumpkin 13.095 % and carrot 12.785 %. While, the lowest fiber value was obtained from sweet potato 5.662 %.

These results agreed with EL-Sayed Sahar (2000), she found that the crude fiber content of yellow carrot was 1.10 %. On the other hand, Robinson and Decker (1997) demonstrated that fresh pumpkin contained 1.1 % of crude fiber.

The same table showed the ash content pumpkin seemed to have the highest value 6.226 %. Next was carrot 5.242 % and sweet potato 4.759 %.

The highest percentage of total carbohydrate was found in sweet potato 89.495 % followed by carrot 84.701 and pumpkin 84.048 %, respectively.

It might be clear that, the sweet potato had the highest value of total calorific due to the high content of carbohydrate , followed by carrot and pumpkin 47.23 k.cal and 32.008 k.cal, respectively.

Total carotenoids, vitamin C, calcium, phosphorus, iron and zinc content of raw materials are shown in Table (2). It could be seen that, pumpkin had a highest value of carotenoids (208.333 mg/100 gm) and vit. C (100 mg/100 gm). While, sweet potato had a lowest value of total carotenoids (84.603 mg/100 gm), also, carrot had a lowest value of vit. C content (75.348 mg/100 gm).

Table (2) The chemical composition of raw materials :

chemical composition	Carrot		Pumpkin		Sweet potato	
	wwb	dwb	wwb	dwb	wwb	dwb
Moisture %	87.790		91.600		75.060	
Crude Protein%	1.038	8.501	0.016	12.100	1.133	4.543
Crude Fat %	0.190	1.556	0.100	1.190	0.300	1.203
Crude fiber %	1.561	12.785	1.100	13.095	1.412	5.662
Ash %	0.640	5.242	0.523	6.226	1.187	4.759
Carbohydrate %	10.342	84.701	7.060	84.048	22.22	89.495
Total calorific K.cal	47.230	-----	32.008	------	96.112	------
Total carotenoids Mg /100gm	28.380	241.474	28.170	335.333	32.070	128.603
Vitamin CMg /100gm	9.200	75.348	8.400	100.000	20.100	80.592
CalciumMg /100gm	39.300	321.867	24.800	295.238	31.200	125.100
PhosphorusMg / 100 gm	36.400	298.116	45.800	545.238	48.900	196.071
IronMg /100gm	0.310	2.539	0.830	9.881	0.640	2.566
ZincMg /100gm	0.250	2.048	0.330	3.929	0.310	1.243

Concerning the mineral contents, it might be clear that pumpkin had the highest value of iron, phosphorus and zinc 9.881, 545.238 and 3.929 mg/100 gm, respectively. While, carrot had the highest value of calcium content 321.867 mg/100 gm. Also, sweet potato had the lowest value content of calcium, phosphorus and zinc 125.100, 196.071 and 1.243 mg/100 gm, respectively.

Ca/P ratio in carrot was (1.080), Ca/P ratio in pumpkin was (0.541) and Ca/P ratio in sweet potato (0.638).

1.2. The chemical composition of types of biscuits and orange juice :

The data presented in Table (3), showed the chemical composition of biscuits and orange juice. It could be noticed that the Tiger Biscuit had the highest value of protein and ash content 11.684 % and 1.471 %. While, the Lux Biscuit had the highest value of fat and carbohydrate content 19.431 % and 68.22 %, respectively.

From the same table, the orange juice had the highest value content of total carotenoids, vit. C, calcium, iron, phosphorus and zinc 16.9, 12.9, 32.0, 0.43, 47 and 0.24 mg/100 gm, respectively.

2-The Chemical composition of 13 blends provided reliable data to explain food insecurity malnutrition and what extended to prevent some nutrient diseases:

From the data presented in table (4) showed that blends no (1) had a high levels of carotenoids 264.75 mg and vit. C , so it recovered the daily requirements of vit A and vit C according to (FNB 1989) . Eating 39.43 gm and 51.059 gm of this blend covered the daily requirements of vit. A and vit.

C respectively . This blend also had a high content in protein , crude fiber , vitamins and minerals more than control blend .

Table (3) The chemical composition of biscuits and orange juice :

chemical composition	Biscuit LUX	Biscuit TIGER	Orange juice
Moisture %	0.826	1.653	-
Crude Protein %	9.157	11.684	-
Crude Fat %	19.431	18.174	-
Crude fiber %	0	0	-
Ash %	1.366	1.471	-
Carbohydrate%	68.22	67.018	-
Total carotenoids Mg /100gm	0.850	1.010	16.90
Vitamin C Mg /100gm	1.210	0.950	12.90
Calcium Mg /100gm	17.00	19.00	32.00
Iron Mg /100gm	0.380	0.410	0.43
Phosphorus Mg /100gm	43.00	45.00	47.00
Zinc Mg /100gm	0.160	0.210	0.24

Blend no (2) had a high value content of protein , carotenoids , vit.C and minerals more than control blend . According to the R.D.A eating 91.140 gm , 23.566 gm , 44.660 gm , 162.204 gm , 59.074 gm covered 109 % , 424 % , 223 % , 61.651 % , 59.074 % of the daily requirements of protein , vit A , vit C , ca , p , fe and zn respectively . Because of that it was very useful to prevent some nutrient diseases (caloric deficiency , diarrhea , night blindness ,scurvy , anemia , dwarfism) .

In blend no (3) the protein , vit.C contents were higher than the control blend . Eating 49.404 gm of this blend will covered 202.41 % the RDA of vit. C .

The more percentage of pumpkin to blends increase the protein , carotenoids , vit c and minerals contents . sequentially it covered the RDA of protein and vitamins . But it cold noticed that the protein in blends from no (1) to no (6) was a plant protein , so it had a deficiency of number of essential amino acids which is important for infant growth . It is very important to support this blend with anther amount of protein (animal protein) like meat ,soybean , milk , dry milk or mushroom .

Also the same table showed that , the addition of LUX biscuits and ascorbic acid pure improve and increase the protein content -due to the dry milk in biscuits – and the content of vit c . So that blends no 7 , 8 , 9 had a good source to covered the RDA to prevent some nutrient diseases (caloric deficiency , diarrhea , night blindness ,scurvy , anemia , dwarfism) .

Concerning to the blends no 10 ,11 , 12 , the addition of TIGER biscuits which supported with soy beans , vitamins and minerals plus orange juice increased the protein , vitamins and minerals comparison with control blend .

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3. Microbiological analysis :

The data presented in table (5) showed the microbial load of baby food blends immediately after sterilization (at zero time) and after storage for six months at refrigerator (5 -10 ºC) . However the total microbial count was increased with increasing storage period there were safety to eat , All blends were free from coliform activity **.**

Table (5):The microbial analysis of baby food blends during storage:

Storage Time (month) / Blends No	T.V.B.C*			C.B.C**		
	0	3	6	0	3	6
1	0.5 X 10^2	0.8 X 10^2	1.5 X 10^2	0	0	0
2	0.4 X 10^2	0.8 X 10^2	2.4 X 10^2	0	0	0
3	0.4 X 10^2	0.9 X 10^2	3.3 X 10^2	0	0	0
4	0.6 X 10^2	1.7 X 10^2	3.8 X 10^2	0	0	0
5	0.9 X 10^2	3.8 X 10^2	4.3 X 10^2	0	0	0
6	1.3 X 10^2	1.8 X 10^2	4.3 X 10^2	0	0	0
7	1.1 X 10^2	2.8 X 10^2	3.3 X 10^2	0	0	0
8	0.6 X 10^2	3.8 X 10^2	3.9 X 10^2	0	0	0
9	0.9 X 10^2	2.5 X 10^2	3.2 X 10^2	0	0	0
10	1.5 X 10^2	2.3 X 10^2	3.6 X 10^2	0	0	0
11	1.8 X 10^2	2.2 X 10^2	5.1 X 10^2	0	0	0
12	1.2 X 10^2	3.2 X 10^2	5.7 X 10^2	0	0	0

*** T.V.B.C. = Total viable bacterial counts .(cells / gm)**
**** C.B.C. = Coliform bacterial counts**

4. Organoleptic test :

Table (6) showed that the organoleptic evaluation of baby food blends . The mean scores for color , taste ,odor , viscosity and over all acceptability ranged as 10.60 – 16.30 , 12.40 – 28.70 , 9.10 – 17.10 ,11.70 – 16.60 and 57.40 – 88.90 respectively . So that the addition of biscuits and orange juice improve the scores of banal tests .

Table (6): Organoleptic evaluation of the reconstituted baby food blends

Blends No	color	taste	odor	viscosity	Over all acceptability
1	14.20	17.40	14.10	13.20	69.50
2	10.60	12.40	9.10	11.70	57.40
3	12.30	28.70	15.30	15.60	82.60
4	11.50	20.90	13.50	12.30	74.30
5	12.0	17.10	11.60	12.40	68.40
6	13.52	19.98	12.94	12.60	73.40
7	12.26	25.20	15.90	16.60	86.40
8	13.0	21.30	14.00	15.60	81.10
9	12.0	22.50	14.24	16.20	84.80
10	16.30	27.20	17.10	15.80	88.90
11	15.0	24.30	15.10	15.0	81.20
12	16.20	26.0	15.70	15.60	84.60
13(control)	13.80	13.60	12.70	12.90	63.30
Sin	Ns	**	Ns	Ns	**
Lsd	11.433	2.475	7.913	2.458	7.407

All values are means of ten replicates ±SD.
Sin (significant) Ns= insignificant different **= significant
Lsd (Least significant difference).

Also, table (6) summarized the statically analysis of average scores for each evaluation organoleptic test . from these data it cold be observed that , there were no significant different in between blends in there color , odor and viscosity . however , with respect to the taste and over all acceptability, the statistical analysis revealed that there was a high significant difference samples .

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أغذية الاطفال المعلبة

مسعد عبد العزيز ابو رية - محمد محمد منصور طبيخة و دينا عبد العظيم هويدى
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أجرى هذا البحث بغرض امكانية تصنيع اغذية للاطفال معلبة من الخضروات والفاكهة المصرية والغنية بالعناصر الغذائية التى يحتاجها الطفل فى مراحل نموة الاولى من ٦الى ١٢ شهر بجانب التغذية على لبن الام ، يتلخص البحث فى تحضير ١٢ خليط من بعض الخضروات والفاكهة (الجزر ، القرع العسلى ، البطاطا) المضاف اليها عصير البرتقال البلدى و نوعين من البسكويت (لوكس وتايجر) وكذلك حمض الاسكوربيك النقى.

وقد دلت النتائج على ان المعلبات التى تحتوى على نسبة عالية من القرع العسلى اعطت نسبة عالية من البروتين وفيتامين سى والفسفور والحديد والزنك وتفى بالاحتياجات اليومية لهذة العناصر الغذائية ، ولكن يعيبها ان البروتين الموجود بها من النوع النباتى وذلك فى المعلبات من ١ الى ٦ .

وباضافة بسكويت لوكس وحمض الاسكوربيك الى المعلبات (٩،٨،٧) ساعد ذلك على تحسن نوع وزيادة البروتين فى هذة الخلطات نتيجة للاحتواء البسكويت على اللبن المجفف وكذلك زيادة نسبة حامض الاسكوربيك زيادة كبيرة (٨٣,٩٦٨، ٧٧,٩٦٣،٩٤,٢٤٨) ملجم على الترتيب مقارنة بالعينة الكنترول (جربر =٢٩,٤٨٥ ملجم).

كذلك اضافة بسكويت تايجر المدعم بالفيتامينات والمعادن والمحتوى على فول الصويا وكذلك اضافة عصير البرتقال البلدى للخلطات (١٠،١١ ، ١٢) ادى الى زيادة محتوى العينات من البروتين والفيتامينات مقارنة بالكنترول .

وقد اشارت نتائج تخزين هذة المعلبات فى الثلاجة على درجة حرارة (٥: ١٠ °م) لمدة ستة اشهر الى حدوث تغيرات طفيفة فى المحتوى الميكروبى لا تؤثر على جودة المعلبات او قابليتها للاستهلاك طوال فترة التخزين .

كما تم اجراء التقييم الحسى لهذة الاغذية فكانت معظمها تتميز بلون وقوام ورائحة جيدة ، الا ان المعلبات المضاف اليها البسكويت او البسكويت وعصير البرتقال اعطت افضل نتائج فى الطعم والقابلية الكلية .

Table (4) :The Chemical composition of 13 blends provided reliable data to explain food insecurity malnutrition and what extended to prevent some nutrient diseases:

Blends No	Chemical composition (on dry weight bases)	explain food insecurity malnutrition to prevent some nutrient diseases
1	moisture (92.56 %) , protein (9.69 %), crude fat (0.511%),crude fiber (14.090 %), ash (5.938 %),total carbohydrate (83.861%) energy (378.803 kcal), total carotenoids (264.785 mg) ,vitamin C (68.548mg),calcium(332.764 mg), phosphors (292.473mg) , iron (3.360mg), and zinc **(**2.688 mg**) ,** Ca/P ratio (1.13776).	caloric deficiency , night blindness, scurvy
2	moisture (96.810%) , protein (12.361%), crude fat (1.473%), crude fiber (16.362%), ash (8.0%),total carbohydrate (78.166 %) energy (375.365 kcal), total carotenoids (442.006 mg) ,vitamin C (78.370 mg), calcium (269.905mg), phosphors (572.410mg) , iron (11.317mg), and zinc **(**3.464 mg**),** Ca/P ratio (0.471524).	caloric deficiency ,night blindness ,scurvy ,anemia, dwarfism .
3	moisture (81.791%) , protein (5.634%), crude fat (0.736 %), crude fiber (8.691 %), ash (5.507%),total carbohydrate (88.123%) energy (381.652 kcal), total carotenoids (182.262mg) ,vitamin C (70.844 mg), calcium (138.393 mg), phosphors (216.926 mg), iron (2.801mg), and zinc **(**1.373 mg**) ,** Ca/P ratio (0.637973).	caloric deficiency , night blindness , scurvy .
4	moisture (87.839%) , protein (8.581%), crude fat (1.447%), crude fiber (11.173%), ash (4.735%),total carbohydrate (85.237%) energy (388.295 kcal), total carotenoids (244.725mg) ,vitamin C (58.648 mg), calcium (196.530 mg), phosphors (284.837mg) , iron (4.605mg), and zinc **(**1.975mg**) ,** Ca/P ratio (0.689974).	caloric deficiency , night blindness ,scurvy .
5	moisture (91.893%) , protein (11.309%), crude fat (1.887%), crude fiber (14.423%), ash (6.011%),total carbohydrate (80.793%) energy (385.391kcal), total carotenoids (301.061mg) ,vitamin C (60.706 mg), calcium (256.568 mg), phosphors (450.228mg), iron (7.278mg), and zinc **(**3.154 mg**)** , Ca/P ratio (0.569862).	caloric deficiency , night blindness , scurvy , anemia .
6	moisture (91.003%) , protein (10.049%), crude fat (1.167%), crude fiber (13.786%), ash (5.956%),total carbohydrate (82.428%) energy (382.011 kcal), total carotenoids (298.955mg) ,vitamin C (47.790mg), calcium (276.759mg), phosphors (382.350mg) , iron (5.466 mg), and zinc **(**2.334 mg**) ,** Ca/P ratio (0.723837).	caloric deficiency , night blindness , scurvy .
7	moisture (80.588%) , protein (12.621%), crude fat (4.889%), crude fiber (10.839%), ash (4.685%),total carbohydrate (77.805%) energy (405.705 kcal), total carotenoids(249.392 mg) ,vitamin C (83.968 mg), calcium (210.179mg), phosphors (269.874 mg) , iron (4.739mg), and zinc **(**2.112 mg**) ,** Ca/P ratio (0.707974).	caloric deficiency , night blindness , scurvy .
8	moisture (85.629%) , protein (14.195%), crude fat (6.263%), crude fiber (14.994%), ash (5.734%),total carbohydrate (73.014 %) energy (408.379 kcal), total carotenoids(311.009 mg) ,vitamin C (94.248mg), calcium (267.901mg), phosphors (455.083 mg) ,iron (7.306mg), and zinc **(**3.479 mg**) ,** Ca/P ratio (0.588686).	caloric deficiency , kwashiorkor, night blindness , scurvy , anemia .
9	moisture (83.361%) , protein (13.522%), crude fat (4.339%), crude fiber (14.457%), ash (5.719%),total carbohydrate (76.42%) energy (398.819 kcal), total carotenoids(289.930mg) ,vitamin C (77.963 mg), calcium (277.060 mg), phosphors (382.836 mg) , iron (5.469mg), and zinc **(**2.314 mg**) ,** Ca/P ratio (0.920967).	caloric deficiency , night blindness , scurvy .
10	moisture (84.239%) , protein (13.324%), crude fat (7.157%), crude fiber (11.611%), ash (4.030%),total carbohydrate (75.489 %) energy (419.665 kcal), total carotenoids(258.29 mg) ,vitamin C (61.338 mg), calcium (246.177mg), phosphors (300.335 mg), iron (5.266 mg), and zinc **(**2.538 mg**) ,** Ca/P ratio (0.819675).	caloric deficiency , night blindness , scurvy.
11	moisture (85.753%) , protein (14.319%), crude fat (6.302%), crude fiber (12.073%), ash (6.127%),total carbohydrate (73.252%) energy (407.002 kcal), total carotenoids (329.87mg) ,vitamin C (65.71mg), calcium (269.530mg), phosphors (474.443 mg) , iron (7.299mg), and zinc **(**3.510 mg**) ,** Ca/P ratio (0.568106).	caloric deficiency , kwashiorkor night blindness , scurvy , dwarfism , anemia .
12	moisture (84.963%) , protein (13.633%), crude fat (6.902%), crude fiber (11.837%), ash (6.062%),total carbohydrate (73.403%) energy (410.262 kcal), total carotenoids (303.8mg) ,vitamin C (53.237mg), calcium (289.951 mg), phosphors (346.059 mg) , iron (5.453 mg), and zinc **(**2.594 mg**) ,** Ca/P ratio (0.837866).	caloric deficiency , night blindness , scurvy .
13 control	moisture (88.35%) , protein (6.867%), crude fat (4.10%), crude fiber (18.025%), ash (4.575%),total carbohydrate (84.458%) energy (402.2 kcal), total carotenoids (162.23 mg) ,vitamin C (29.485 mg), calcium (242.918 mg), phosphors (303.004 mg) , iron (3.863 mg), and zinc **(**1.974 mg**) ,** Ca/P ratio (0.801699).	caloric deficiency , night blindness .