

PRODUCING BISCUITS ENRICHED WITH VITAMIN A AND IRON BY USING SWEET POTATO AND PUMPKIN POWDER FOR PRIMARY SCHOOL CHILDREN.

Ramadan, Afaf-haniem M.; A. A. Abd El-Kader and M. M. Abd-Alla

Home Economics Dept/, Fac. of Specific Education, Mansoura Univ., Mansoura, Egypt.

ABSTRACT

Biscuit produced from wheat flour (WF 100%) supplemented with sweet potato powder (SPp) and pumpkin powder (Pp) at three level (5,10and15%) to enrich vitamin A and replacement sugar with black strap molasses to produce biscuits enriched with iron. The products were analyzed chemically and organoleptic evaluation was carried out. The results indicated the high contents of vitamin A found in Pumpkin powder (Pp) followed by sweet potato powder (SPp) with 12663.67 and 8551.33 IU/100g respectively . As a result of supplemented sweet potato powder (SPp) and pumpkin powder (Pp) to wheat flour (WF 100%) gave higher vitamin A content (1041.33,1777.33,1041.33 and 1458.33 IU/100g respectively on other biscuit samples. The lowest level of vitamin A supplemented both of 10 % with sweet potato powder (SPp) and pumpkin powder (Pp) were 666.67 and 877.33 IU /100 g respectively in biscuit formula. On other hand iron content was higher in biscuit formula with black strap molasses than control. The percentage of iron content was increased from 1.40 to 5.90 mg /100g respectively for all biscuit formula. Evaluation of organoleptic properties clearly indicated the best tow samples, the supplemented with 10% sweet potato powder (SPp) and 5% pumpkin powder (Pp) .showed that the best overall acceptability and ability value were (76.04 and 91.40 %), The quantities of this two chosen samples covered the daily requirement of vitamin A for children (9- 12 year) showed that 137.11g and 192.1g from tow best samples .Supplementing both of sweet potato and pumpkin powder to wheat flour improved protein efficiency ratio and biological value (2.91, 2.86 ,80.52, 79.99). finally, results indicated that Supplementing both of sweet potato and pumpkin powder to wheat flour at different levels with replacement sugar by black strap molasses were optimal for producing of biscuits riches in vitamin A and iron content .

Keywords: Biscuit, Vitamin A, Iron Sweet, Potato, Pumpkin, Blackstrap, Molasses, Fortification.

INTRODUCTION

Deficiencies of iron and vitamin A are prevalent worldwide and can affect the mental development and learning ability of schoolchildren , malnutrition is recognized as an important public health problem affecting > 2 billion people worldwide., micronutrient deficiencies can have significant negative consequences on health and economic development (UNICEF/MI, 2004). Malnutrition is considered a common health problem in Egypt, which the children are the most vulnerable group of malnutrition (Rashed, 2002).

Strategies to control vitamin A deficiency include dietary diversification , food production of β - carotene rich crops , such as orange

fleshed, sweet potato . the consumption of β - carotene increased the V.A intake of Kenyan women and children .

Vitamin A or carotenoids (provitamin A) required for growth, development and physiological functions, or vitamin A in prevention of blindness which is widely recognized (Macleran, 1986 and Sommer 1995).

Provitamin A (carotenoids) are a major source of dietary vitamin A in a large proportion of the world population and β -carotene (β c) is the most common provitamin A carotenoids (IVACG, 1999).Iron is an essential component of hemoglobin, the oxygen transporting protein blood (Bothwell *et al.*, 1979).iron deficiency is the result of long-term negative iron balance (UNICEF/UNU, 2004).

Sweet potatoes are highly nutritious vegetables; however sweet potato consumption is progressively declining especially in industrialized nations. Grabowski *et al.*, (2006) suggested the use of sweet potato into dried powder as functional ingredient in food system. Also pumpkin powder is a good source of carotene, minerals, vitamins and other substances that are beneficial to health. These facts lead to the processing of pumpkin into various food products (Jun *et al.*, 2006). Moreover supplementation with black strap molasses caused an improvement in all the quality characteristics of the product and enhance iron content (Makhoul, 1991).

A major advantages of using biscuit as a carrier for micronutrients is that biscuit is regard as snack than a meal and therefore unlikely to replace meals given to child home and also it is easy to disrups , no preparation , long self life . (Asal,2004)

The aim of this study was to supplement biscuits with sweet potato and pumpkin powder as vitamin A sources for primary school children. Also to replace sugar with black strap molasses as source of iron.

MATERIALS AND METHODS

Materials:

Wheat flour *Triticum vulgare* (72% extraction) , Sweet potato and Pumpkin (*Ipomoea batatas*) and (*Cucurbita moschata* Duch)) were obtained from El-Mansoura local market.

Black strap molasses, sugar, salt, vanillin, baking powder and vegetable shortening were obtained from local market.

Methods:

Preparation of sweet potato and pumpkin powder:

Fresh sweet potato and each fruit from pumpkin were cleaned and washed with distilled water, sweet potato peeled and cut into slices and soaked in boiling water for 15 min then cooled with distilled water and dried in an air oven dryer 50-60 °C for 24hr, and then ground to 40 mesh sieve .

Pumpkin was cut into sections, after removal of seeds, peeled sections were cut into small pieces that dried in an air oven dryer 40-50 °C for 24hr, and finally milled in order to pass through a 30 mesh sieve.

Preparation of biscuits:

Control Biscuits sample were prepared included 100 g of ingredient with baking powder 3g, water 26.1 ml, shortening 20g, salt 1g and sugar 40g according to the method described by Abdel-Magied (1991). The supplemented biscuits were prepared using the same formula expect for replacement sugar with blackstrap molasses and wheat flour (72%) with sweet potato or pumpkin flour at 5,10and 15 % (table 1). All Different biscuits formula were baked at 230 C for 10: 15 min then cooled and packaged in poly ethylene bags for further investigation .

Table (1): Biscuits formula from wheat flour, sweet potato and pumpkin powder.

Ingredients (%)	Samples	Control (1)	Control (2)	1	2	3	4	5	6
Wheat flour(w.f)		100	100	90	90	85	85	75	75
Sweet potato powder(S.P.p)		-	-	10	-	10	5	10	15
Pumpkin powder(P.p)		-	-	-	10	5	10	15	10

Chemical analysis:

Moisture, crude protein, crude fat, crude fiber and total ash were carried out according to methods of A.O.A.C. (2000).While Total carbohydrates were estimated by difference, food energy was calculated by multiplying carbohydrates, fat and protein contents by 3.87, 8.79 and 4.27 K. cal/g., respectively, according to Radi and Arous (2000).

Vitamin A was determined according to the method of A.O.A.C. (2000). and iron measured according to Lutén *et al.*, (1996).

Amino acids were determined in the acid hydrolysate according to the method described by Pellet and Young (1980), using Backman amino acid analyzer. In Alexandria central lab. Faculty of agriculture, Alex. University

Protein efficiency ratio (PER): was estimated using the equation

$PER = 0.684 + 0.456 (\text{Leucine}) - 0.047 (\text{praline})$. according to Alsmeyer *et al.* (1974).

Biological value (BV) was calculated by the following equation.

$BV = 49.9 + 10.53 (PER)$. According to Mitchell and Block (1946).

Organoleptic Evaluation:

Biscuit samples were evaluated organoleptically by 10 panelists for appearance, color, thickness, shrinkage, taste and odor according to the method described by Smith (1972).

Physical Measurements :

Physical measurements were carried out according to Abdel-Magied (1991) as following, thickness, Diameter (both average of 15 biscuits) (cm), weight of 15 biscuits (g) and stock height of 15 biscuits (cm). The diameter and thickness of biscuits measured by Plano meter to the nearest mm.

Statistical Analysis : statistical analysis of the data was performed using the statically program (spss computer soft ware) .

RESULTS AND DISCUSSION

The proximate chemical composition of raw material used in making biscuit were shown in table (2), moisture content were 4,54 and 8,69 % in both of sweet potato and pumpkin powder . Wheat flour had the highest percentage of protein content 12.66% followed by sweet potato 4.50% and pumpkin powder 3.80% .

Vitamin A in both of pumpkin powder and sweet potato powder were 12663.67 and 8551.33 IU/100g respectively. These results were in agreement with those obtained by (Ally,. 2001) .

It could be observed that sweet potato powder had the highest amounts of carbohydrate (80.47%) meanwhile the amounts of carbohydrate in pumpkin powder was (75.62%). on the other hand, the high ash percentages was found in pumpkin powder followed by sweet potato and wheat flour were (5.39, 3.87and 0.55%) respectively. the results also revealed that the highest amounts of fiber found in sweet potato followed by pumpkin powder and wheat flour (4.94, 3.50and 0.58%) .

Strap molasses has high amount of Fe content (28 mg/100gm). In compare with sweet potato (4.25) and pumpkin (3.55)mg/g. These results were in agreement with those obtained by, Heinonen *et al* ., 1989 ; Grabows *et al.*, (2008) and Noor *et al.*, (2009).

Table (2): Proximate composition of raw material used in making biscuit (calculated on dry weight basis).

Samples	constituents							
	Moisture	Crude protein	Crude fat	Ash	Fiber	Carbohydrate	Vit.A (IU/100g)	Fe (mg/100g)
Wheat flour	12.66±0.66	10.53±1.45	1.45±0.96	0.55±0.32	0.58±0.32	76.89	-	1.34
Sweet potato	4.54±1.64	4.50±0.73	1.67±0.01	0.87±0.39	4.94±0.77	80.47	8551.33	4.25
pumpkin	8.69±1.49	3.80±0.55	3.00±0.02	5.39±0.82	3.50±1.32	75.62	12663.67	3.55
Black strap molases	23.7±2.13	-	-	4.33±1.35	-	-	-	28

Carbohydrate was calculated by difference.

Table (3) represented the chemical composition of different biscuits formula processed by using potato and pumpkin powders with different levels. Moisture content of supplemented biscuits ranged from 5.23 to 7.67%.As a result of adding sweet potato and pumpkin powder to wheat flour.

Ash and fiber content of biscuit formula tended to increase by increasing the level of added fortified materials .Concerning to fat , there is a gradual increase on the fat content when compared with un fortified formula this may be attributed to its high content of fat before addition to the flour .

Vitamin A content was higher in formula contained 10% sweet potato and 10% pumpkin (666.67, 877.33 IU/100g).. These results are in agreement with those reported by Singh and Bradbury (1988) ; Hussein (2001) and Puppo *et al.*, 2005)

Concerning Fe content , results showed that the higher percentage (5.20 and 4.90) was obtained for biscuits formula with sweet potato 10% and sweet potato powder 10%+pumpkin powder 15% , it could be observed that the replacement of sugar with black strap molasses increase the content of Fe from 1.40 mg/g in control sample to be more than 5mg/g. after replacement therefore , black strap molasses enhance the content of iron of biscuits formula this result agree with those obtained Abde el mageed (1995)

Table (3): Chemical composition of biscuits made from wheat flour (72% extract.) fortified with sweet potato and pumpkin .

Samples	constituents							
	Moisture	Crude protein	Crude fat	Ash	Fiber	Carbohydrate	Vit.A (IU/100g)	Fe (mg/100g)
100% W.F	5.78± 0.17	10.53± 0.8	12.33± 0.22	2.50± 0.49	0.34± 0.13	70.38	-	1.40
100% W.F With molasses	5.66± 0.67	8.77± 0.32	13.33± 0.22	2.50± 1.40	0.50± 0.23	69.24	-	5.40
90% W.F + 10% S.P.p	5.55± 0.49	7.08± 0.32	13.30± 0.88	2.50± 1.13	0.86± 0.12	70.71	666.67	4.90
85% W.F + 10% S.P.p + 5% P.p	6.33± 1.17	7.89± 0.32	14.00± 0.67	2.50± 1.88	1.00± 0.38	68.28	1041.33	4.80
75% W.F + 10% S.P.p + 15% P.p	6.37± 1.05	6.69± 0.43	14.00± 0.89	2.50± 1.30	1.00± 0.34	69.44	1777.67	5.20
90% W.F + 10% P.p	5.23± 1.04	7.67± 0.6	12.89± 0.94	2.00± 1.25	0.51± 0.30	71.70	877.33	4.70
85% W.F + 10% P.p + 5% S.p.p	6.43± 1.01	7.48± 0.32	13.16± 0.34	1.50± 1.32	1.00± 0.18	70.43	1041.33	5.30
75% W.F + 10% P.p + 15% S.p.p	7.76± 1.48	7.30± 0.66	12.97± 0.11	2.50± 0.46	1.00± 0.23	68.47	1458.33	5.40

• Carbohydrate was calculated by difference

The data presented in table (4) that biscuits formula contained wheat flour + 10% sweet potato powder and its mixture with 5 and 15% pumpkin powder the best overall acceptability from 74.7 to 72.30% .

Addition of 10% sweet potato powder and 10% pumpkin +15% sweet potato powder to wheat flour showed the best ability values (91.40 and 89.85) respectively addition of pumpkin powder to sweet potato improved colour , taste and odour in all produced biscuits under investigation . these were in agree with (Hussien 2001; Lee *et al.*, 2002 and Ponjanta *et al.*, 2004)

Table (4): The organoleptic evaluation of biscuits made from wheat flour and sweet potato and pumpkin powder and its mixtures.

Samples	Appearances (10)	Color (15)	Crispiness (15)	Taste (15)	Odor (15)	Total (100)	Ability Value %
100% W.F (72% extra.)	8.98	13.12	13.32	12.25	12.50	83.67	100.0
With molasses							
100% W.F (72% extr.)	8.50	12.66	12.36	12.25	11.95	83.19	100.0
90% W.F + 10% S.p.p	7.03	10.98	11.00	11.00	11.88	72.30	88.11
85% W.F + 10% S.p.p + 5% P.p	7.55	10.25	10.31	11.84	12.57	76.04	91.40
75% W.F + 10% S.p.p + 15% P.p	7.29	9.25	7.51	7.37	12.00	68.88	82.29
90% W.F + 10% P.p	8.24	11.33	11.67	10.11	11.23	74.61	88.93
85% W.F + 10% P.p + 5% S.p.p	8.50	12.75	9.25	10.75	11.00	74.75	89.85
75% W.F + 10% P.p + 15% S.p.p	8.55	12.20	10.31	9.84	10.30	74.72	89.82

Data in table (5) showed the baking quality parameters of produced biscuits, detectable increase were observed in biscuits diameter and thickness after baking .

Table (5): Baking quality parameters of biscuits made from wheat flour mixed with sweet potato and pumpkin .

Samples	Biscuits before baking		After baking					
	*Thick-ness (cm)	*Diam-eter (cm)	*Thic-kness (cm)	*Diameter (cm)	Spread ratio	**stock Weight (gm)	** stock high (cm)	Stock high/ stock weight %
100% W.F	0.40	5	0.66	5.20	7.87	94.85	11.25	12.00
With molasses								
100% W.F	0.40	5	0.75	5.40	7.20	88.30	10.55	12.00
90% W.F +10% S.p.p	0.40	5	0.97	5.20	5.36	93.35	9.80	10.00
85% W.F + 10% S.p.p + 5% P.p	0.40	5	0.69	5.20	7.54	96.85	12.20	13.00
75% W.F + 10% S.p.p + 5% P.p	0.40	5	0.68	5.20	7.65	102.25	10.80	11.00
90% W.F+10% P.p	0.40	5	0.75	5.00	6.67	97.25	10.20	10.00
85% W.F + 10% P.p + 5% S.p.p	0.40	5	0.62	5.30	8.54	98.50	10.30	10.00
75% W.F + 10% P.p + 15% S.p.p	0.40	5	0.83	5.40	6.50	100.55	10.90	11.00

* Average of 15 biscuits

** Based on 15 biscuits

The addition of sweet potato powder with the percentage of 10% and pumpkin of 5% for white flour recorded the highest high stock/ stock weight % were 13 and 11.00% respectively , but the addition of 10% pumpkin powder and 5% sweet potato powder to wheat flour increased the spread ratio for formulated biscuit from 7.20and 7.87% to 8.54% .

The data indicated that sample of biscuits contained 85% wheat flour + 10% pumpkin + 5% sweet potato. Was the best biscuit formula for spread ratio.

It can be concluded from data tabulated in table (7) that the best chosen formula which cover the daily requirements of vitamin A, iron, essential amino acids, and calories for children from (9 to 12 years).

Samples can be arranged as the following descending manner:

- The first formula composed of 85% wheat flour + 10% pumpkin + 5% sweet potato. And the data indicated that 192.1g covered the daily requirements of vitamin A, and 101.8% of iron.
- The second formula contained were 85% wheat flour + 10% sweet potato + 5% pumpkin and indicated 137.11g covered the daily requirements of vitamin A, 108.4% of iron.

Both protein efficiency ratio (PER and BV) of supplemented biscuit in compare with control sample

The proximate composition of biscuits provided a good caloric value i.e. 552.9 and 559.6 K.cal/100g. The results are in agreement with those reported by **Johnson et al., (1985) and Baker (1997)**.

Table (7): The quantities of different biscuit formula covered the daily requirement of vitamin A , iron (Fe), essential amino acids (EAA), calories and biological value (BV) for children (9-12 years).

Biscuits with different formula									
Measurements	*FAO/ WHO/UNU	1		2		3		4	
		A	B	A	B	A	B	A	B
Vit.A (IU/100g)	2000	-	-	-	-	1041.33	192.1	1458.67	137.11
Fe mg/100g	10	1.40	714.3	5.40	185.2	5.30	188.7	4.80	208.2
Lysine	2.88	0.77	374	0.71	405.6	0.69	417.4	0.91	316.5
Leucine	2.88	0.44	654.5	0.45	640	0.45	640	0.39	738.5
Isoleucine	1.81	0.25	724	0.27	670.4	0.29	624.1	0.22	822.7
Valine	2.31	0.33	700	0.35	660	0.30	770	0.06	3850
Histidine	1.13	0.85	132.9	0.75	150.7	0.71	159.1	1.02	110.8
Theronine	2.25	0.47	478.7	0.39	576.9	0.19	118.4	0.45	500
Total portein	16	8.67	184.5	8.77	182.4	7.48	213.9	7.30	219.2
Calories/100g	2400	428.5	560.1	434	553	434.08	552.9	428.9	559.6
PER		2.42		2.46		2.91		2.86	
BV		75.35		75.80		80.52		79.99	

FAO/WHO/UNU daily requirements for children (9-12 years).

FAO/WHO/UNU (1984).

UNCEF/UNU/WHO/MI, (1999)

A- Content in sample.

B- Quantity covered the daily requirement.

1- 100% wheat flour (72%)

2- 100% wheat flour (molasses).

3- 85% wheat flour + 10% pumpkin + 5% sweet potato (molasses).

4- 75% wheat flour + 10% Sweet potato + 5% pumpkin (molasses).

REFERENCES

- Abdel-Magied, M.M. (1991): Effect of dietary fiber of potato peel on the rheological and organoleptic characteristics of biscuits. *Dep. of Food Sci.*, 19(3). 293-300.
- Abd El-Mageed, H.A (1995): Studies on blanced diet for pupils of first stage of principle education. M.Sc.Thesis, Faculty of Agriculture, Food Science, El- Mansoura Univ., El-Mansoura, Egypt.
- Alsmeyer, R.H.; Cunningham, A. E. and Happich, M. L. (1974): Equations predict PER from amino acid analysis. *Food Tec.*, 28 (1) 34.
- Ally, N. M. (2001). Effect of addition B-carotene on quality of macaroni and some bakery products. M.Sc. Thesis, Food Science and Technology Dept., Fac. of Agric.,Cairo Univ.
- Asal. M.A.(2004). Studies on yellow corn flour fortification with some dairy products and use it in some cereal products .M.Sc.Thesis, Food Sci, & The., Fac. of Agric., Moshtohor, Zagazig Univ., Egypt.
- A.O.A.C. Association of Official Analytical Chemists (2000). *Official Methods of Analysis*. 17th edition. The Association, Washington DC. USA.
- Baker, A.A. (1997): Production of iron fortified bread employing some selected natural iron sources. *Nahrung*, 41 (5): 293-298.
- Bothwell TH. Chariton RW, Finch CA, and Cook JD. Iron metabolism in men. Blackwell Scientific Publications, Oxford, 1979.
- FAO/WHO/UNU (1984): Protein and Energy requirement. FAO, Rome, Impress. Friedman, M. and fialy, J.W 1971. Methods of tryptophan and analysis. *J. Agric. Food Chem.* 19:626.
- Grabowsk ; J . A. , Truong , V. D., Daubert, C. R. (2006). Spray drying of amylase hydrolyzed Sweet potato puree and physico chemical properties of powder. *Journal of Food Science* , 71 , E209-E217
- Heinonen, M.I.; Ollilainen, V.; Linkola, E.K.; and Varo, P.T. (1989): Carotenoids in Finnish foods: vegetables, fruits, and berries. *Journal of Agriculture and Food Chemistry*. 37: 3, 655-659;27 ref.
- Hussein, M.N. (2001): Effect of addition B-carotene on quality of macaroni and some bakery products.Thesis .M.Sc. Food Science and Tech. Department. Faculty of Agriculture, cairo University.
- Hussien, M.A; M.A.Abou-Raya and Rasha M.E.Maawad. (2010). Effect of some additives to produce low calorie bread . *J. of Food and dairy Sciences*, 1 (2): 55-68.
- IVACG, International Vitamin A Consultative Group (1999). *The Bioavailability of Dietary Carotenoids: Current Concepts*. Washington, DC: ILSI.
- Johnson, C.D.; Berry, M.F. and Waver, C.M. (1985): Soybean hulls as an iron source of bread enrichment. *J. Food Sci.*, 50: 1275.
- Jun H, Lee K. M. (1991). Effect of some additives on the quality of white pan bread dough and its final product, ph. D. Thesis, Food Sci and Technol. Dept. Fac. AGRIC, Cairo Univ.,Egypt.

- Lee C, Cho J, Lee SJ, Koh W, Park W, Kim C. (2002). Enhancing β -carotene content in Asian noodles by adding pumpkin powder. *Cereal Chem* 79(4): 593-5.
- Luten, J. Crews, E. Flynn, A.; Van, D.P. (1996). Interlaboratory trial on the determination in vitro iron dialysability from food. *J. Sci. Food Agric.*, 72:415-424.
- Makhlouf, S. K. M. (1991). Effect of some additives on the quality of white pan bread dough and its final product, ph. D. Thesis, Food Sci and Technol. Dept. Fac. AGRIC, Cairo Univ., Egypt
- McLaren DS. (1986): Global occurrence of vitamin A deficiency. In: Vitamin A deficiency and its control (Bauernfeind JC ed). Orlando: Academic Press Inc
- Mitchell, H.H. and Block, D. (1946): The correlation of amino acids composition of protein with their nutritive value. *Nutrition Abstract and Review*, 16: 249.
- Rashed, M. (2002): Gender Differences in Nutritional Status of Egyptian Children. *Egypt. J. Nutr.* (3) : 177.
- Noor, A.A.; Aziah and C.A. Komat. H I. (2009). Physicochemical and Functional Properties of Peeled and unpeeled pumpkin flour. *Journal of Food Science* (74), Nr. 7.
- Pellet, P. L. and Young, V.R. (1980): Nutrition of protein Foods. *Food and Nutrition Bulletin*, Supplemental. Published by the United Nations University.
- Pongjanta, J., Naulbunrag, A., Kawngdang, S., Manon, T. and Thepjaikat, T. (2006). Utilization of pumpkin powder in bakery products. *Songklanakarin J. Sci. Technol.*, 28(1):71-79.
- Puppo MC, Calvelo A, Anon MC. (2005). Physicochemical and Rheological Characterization of Wheat Flour Dough. *Cereal Chem.* 82(2): 173- 181
- Radi, O.M.M. and Arous, S.A. (2000): New production from simi Dates for young children (tamrloz). *Proceeding of the Fifth Egyptian Conference of Home Economics*. Minufya. Univ., (16-17 July 2000).
- Sai Manohar, R. and Haridas Ras, P. (1997): Effect of mixing period and additives on the rheological characteristics of dough and quality of biscuits. *J. Cereal Sci.*, 25 : 197.
- Singh, U., and J. H. Bradbury, 1988. HPLC determination of vitamin A and vitamin D2 in south pacific root crops. *J. Sci. Food Agric.* 45:87– 94 .
- Smith, W. H. (1972): Raw materials in " Biscuits, crackers and cookies" VT. Applied science Publishers L.T. D. London. P. (97).
- Sommer A. (1995): Vitamin A deficiency and its consequences. A field guide to detection and control. Third edition. WHO, Geneva.
- UNICEF/UNU/WHO/MI, (1999). Preventing iron deficiency in women and children technical consensus on key issues, International Nutrition Foundation, Boston, MA.
- UNICEF/ Micronutrient Initiative. (2004). Vitamin and mineral deficiency. A global progress report of Hawa: Micronutrient Initiative.

إنتاج بسكوييت مدعم بفيتامين ا والحديد باستخدام مسحوق البطاطا والقرع العسلي لأطفال المدارس الابتدائية

عفاف هاتم محمود رمضان، أماني احمد عبدالقادر سلو و مديحة محمد محسن عبداللله
قسم الاقتصاد المنزلى - كلية التربية النوعية - جامعة المنصورة- المنصورة - مصر

تم إنتاج بسكوييت من دقيق القمح ومدعم بخلطات من مسحوق البطاطا الحلوة ومسحوق القرع العسلي بنسب ٥-١٠-١٥% من دقيق القمح لزيادة نسبة فيتامين (ا) واستبدال السكر بالعسل الأسود لإنتاج بسكوييت غني بالحديد. وأجريت التحاليل الكيماوية والتقدير الحسية وأوضحت النتائج ارتفاع محتوى مسحوق القرع العسلي من فيتامين (ا) ثم مسحوق البطاطا وكانت النسبة (١٢٦٦٣,٦٧ و ٨٥٥١,٣٣) وحدة دولية على التوالي. وفي جميع الخلطات تحت الدراسة ارتفع محتواها من فيتامين (أ) (١٠٤١,٣٣، ١٧٧٧,٦٧، ١٠٤١,٣٣ و ١٤٥٨,٣٣ وحدة دولية) بينما كانت اقل نسبة لفيتامين (ا) في العينات المحتوية على ٩٠% دقيق قمح + ١٠% من كرام من مسحوق (البطاطا الحلوة و القرع العسلي) .

و كذلك ارتفع محتوى الحديد لجميع العينات بعد استبدال السكر بالعسل الأسود مقارنة بالعيينة الكنترول . وكانت نسب الزيادة في محتواها من الأملاح المعدنية (الحديد) من (١٠,٤٠ الى ٥,٤٠%) لكل خلطات البسكوييت .

وأوضحت نتائج التقييم الحسي وجد أن أفضل عينتين هما ١٠% من مسحوق البطاطا مع ٥ % مسحوق القرع. وأظهرت أن نسبة القبول والقابلية هي (٧٦,٠٤) و (٩١,٤٠) على التوالي . بينما العينة الاخرى المحتوية على ١٠ % من مسحوق القرع العسلي مع ٥% من مسحوق البطاطا الحلوة وأظهرت القابلية والقبول (٧٤,٧٥) (٨٩,٨٥) % . وقد وجد ان الكميات التي تغطي الاحتياجات اليومية من تلك العينتين المختارة من فيتامين (أ) لأطفال المرحلة الابتدائية في المرحلة العمرية من ٩: ١٢ عام هي ١٣٧,١١ جم و ١٩٢,١ جم .

من النتائج السابقة اتضح تحسن نسبة كفاءة البروتين والقيمة الحيوية (٢,٩١ و ٢,٨٦) (٨٠,٥٢ و ٧٩,٩٩) على التوالي نتيجة للاستبدال في العينتين السابقتين مقارنة بالكنترول وأوضحت النتائج أن الاستبدال بمسحوق البطاطا والقرع العسلي بالنسب المختلفة والسكر بالعسل الأسود مناسب لإنتاج بسكوييت غني بمحتواه من الحديد وفيتامين (ا) لأطفال المدارس.

قام بتحكيم البحث

كلية الزراعة - جامعة المنصورة
كلية الزراعة - جامعة الاسكندرية

أ.د / محمد محمد منصور طبيخه
أ.د / محمد عبد الحميد زيتون

