PREPARATION AND EVALUATION OF SOME SUPPLEMENTED PIES FOR VEGETARIAN

HODA H. A. HAFEZ

Food Technology Research Institute, ARC, Giza, Egypt.

(Manuscript received 7 November 2017)

Abstract

The number of people claiming to be vegetarian has increased for health and economic reasons, this study was a trial to produce improved pies to meet the Recommended Dietary Allowances (RDAs) by supplementing wheat flour with germinated mung bean, germinated sweet lupine and lupine protein isolate, in addition of using date, mushroom and tofu which prepared from (soy bean and sweet lupine flour) separately for filling pies as they are rich in their content of protein, vitamins and minerals. The produced pies were evaluated for nutrition value, physical properties, sensory properties and economic cost. It was found that all supplemented pies had the highest value of protein, fat, ash and crud fiber. The protein was 8.5 % for control sample while it was ranged between 18.39- 23.8 % for supplemented pies. Also supplemented pies were the highest in mineral contents (i.e. Fe, Ca, Zinc and K) and vitamins by comparing with control sample, for example Fe and Ca were 1.3 and 19.9 mg/100gm respectively in control one while Fe and Ca were ranged between 4.1-7.91, 28-52.1 mg/100 gm in supplemented pies. The organoleptic evaluation showed that all the supplemented and filled pies were accepted especially pies containing germinated sweet lupine flour and filled with date or mushroom. The essential amino acids were increased in supplemented pies compared with control pie; consequently, the biological value was increased for supplemented pies. All types of Supplemented and filled pies were the highest in contribute of most of recommended daily Allowances for studied previous nutrients for children and adults. The increasing rate of cost ranges between 23.2% to 56.7%, so it could be recommended that pie as bakery product with a high nutritional value to contribute the (RDA)

INTRODUCTION

"Vegetarian" is a blanket term for a variety of diets that exclude meat, poultry, and fish. The most healthful, the pure vegetarian (or "vegan") diet, only includes foods of plant origin, such as nuts, seeds, vegetables, fruits, grains, and legumes. A "lacto-vegetarian" includes these plant foods and also dairy products. A "lacto-ovo-vegetarian" consumes both dairy and eggs Appleby *et al.*, (2002)

The number of people claiming to be vegetarian has increased in the last 50 years, although vegetarianism has been practiced for centuries. There is no single dietary pattern that characterizes vegetarianism; several dietary patterns have been

identified, from inclusion of some meat products or fish eaten occasionally to extreme avoidance of all animal products. In addition to dietary differences between meat-eaters and vegetarians, a range of lifestyle differences have also been identified. It has been suggested that these lifestyle factors may account for some of the differences in health out-comes that have been reported between vegetarians and meat-eaters. Allen *et al.,* (2000)

There is now evidence that vegetarians have lower rates of mortality than the general population, but similarly favorable mortality rates have been identified amongst health-conscious meat-eaters. However, analyses have shown that there is a moderate reduction in mortality from CHD among vegetarians compared to meat-eaters. This is further supported by evidence that a number of established risk factors, including blood lipid profiles, blood pressure and body mass index (BMI), are all more favorable in vegetarians and vegans. In terms of nutrition, vegan and vegetarian diets can be nutritionally adequate, provided they are carefully planned; both the British Dietetic Association and the American Dietetic Association provide guidelines for a healthy vegetarian diet. Dietary differences between vegetarians and meat-eaters are characterized not only by meat and/or fish being excluded from the diet, but by the foods which are eaten in greater amounts by vegetarians. For vegetarians and meat-eaters alike, the key to a nutritionally adequate diet is balance and ensuring that, where foods are specifically omitted, suitable alternatives are included so that dietary quality is not compromised. Appleby *et al.,* (2002).

A lacto-vegetarian or lacto-ovo-vegetarian diet can easily meet the Recommended Dietary Allowances (RDAs) for all vitamins, minerals, protein, and other nutrients. A varied vegan diet will also ensure adequate amounts of all nutrients except, perhaps, Vitamin B12. Vitamin B12 supplements or B12-fortified soy or rice milks are ideal sources of B12, Vitamin D, and added calcium. (Certain algae and some fermented soybean products, such as tempeh and miso, are plant sources of Vitamin B12. Allen *et al.,* (2000)

Good vegan calcium sources include broccoli, kale, turnip greens, tofu prepared with calcium, and fortified beverages including orange juice, soy or rice milk (check the labels). Besides that, animal sources of protein can be sources of saturated fat which has been linked to elevated low-density lipoprotein (LDL) cholesterol, a risk factor for heart disease. In addition, for people with certain kidney diseases, a lower-protein diet may be recommended to help prevent an impairment in kidney function. American Dietetic Association (2003).

Mushrooms proved to be good sources of almost all essential amino acids when compared with common vegetables. The present mineral values add to the safe

consumption of mushrooms as supplementary foods to the populations preponderantly dependent on cereal diet. Mallikarjuna *et al.,* (2013).

Lupine has comparable nutritional and functional properties to soybean. Lupine can be used to replace soybean in a number of food products including tofu. In comparison with soybean, lupine has lower fat content, whereas, its protein content is comparable. The fat content of tofu can be reduced by lupine substitution without affecting its sensory acceptability. A tofu with lesser fat but comparable protein contents will be a healthy alternative to the normal tofu and could be a great choice for low fat and high protein healthy diets. Jayasena *et al.,* (2010).

The mung bean (*vigna radiate L.) Wilczek* is one of the most important short – season, summer-growing legumes and is grown widely throughout tropic and subtropic regions. Mung beans have wide applications in agriculture, health food, pharmaceutical and cosmetics industries. Mung bean seeds and sprouts are excellent examples of functional foods that lower the risk of various diseases. Moreover, the seeds and sprouts have health –promoting effects in addition to their nutritive value Camacho *et al.,* (1992).

The fruit (dates) of the date palm (phoenix dactylifera L.) contain a high percentage of carbohydrate (total sugars 44-88%), fat (0.2-0.5%), almost 15 salts and minerals. Protein (2.3-5.6), vitamins and a high percentage of dietary fiber (6.4-11.5%). The percentage of each mineral in dried dates varies from 0.1-916 mg/100g date depending on the type of mineral. Dates contain at least six vitamins including a small amount of vitamin C, vitamins B1 thiamine, B2 riboflavin, nicotine acid (niacin) and vitamin A. The dietary fiber of 14 varieties of dates has been shown to be as high as 6.4-11.5 % depending on variety and degree of ripeness. Dates contain 0.5-3.9 pectin which may have important health benefits (Walid and Richard 2003)

Because of the number of people claiming to be vegetarian has increased, this study aimed to produce improved nutritional value pies to meet the Recommended Dietary Allowances (RDA) by using mung bean, sweet lupine, mushroom and dates which are rich in their content of protein, vitamins and minerals. The produced pies were evaluated for nutrition value, physical properties, sensory properties and economic cost.

MATERIALS AND METHODS

Materials:

-Wheat flour 72 % was obtained from the South Cairo Flour Mills Company, Giza, Egypt.

-Mung bean (Giza 111) was obtained from Field Crops Research Institute , Agric. Res., Center, Giza, Egypt.

-Sweet lupine, soy bean flour, Corn oil, sesame, salt, dry yeast and improver were purchased from local market, Giza, Egypt.

Methods:

-Preparation of legumes flour

-Germinated legumes: legumes seeds (mung bean and sweet lupine) were germinated according to Doweidar and Amer (2005) by soaking seeds in water (1:3 w/v) for 24 hr. and spread on perforated trays lined with cheese cloth. The seeds were germinated for 24 hr. in the dark at room temperature (25- 30 °C) and 85% RH. During this period seeds were rinsed three times daily with water. Germinated seeds were dried at 50 °C in an electric oven over night. The germinated seeds were ground, sieved an packed in polyethylene bags until using.

Preparation of lupine protein isolate:

lupine protein isolate was prepared by isoelectric precipitation method. The pH of the alkaline extraction was 10 using NaOH (1.0 N,1:10 w/v) and the precipitation of protein process was done at pH 4.5 by using HCl 1N followed by centrifugation at 4500 rpm for 20 min. the precipitated residue was washed several times with deionized water and kept at 4 °C in the refrigerator until using (Alamanous and Doxastakis 1997)

Preparation of sweet soy- lupine tofu:

Preparation of soy-lupine tofu, the method developed by Jayasena *et al.* (2010) A sample of 210g soybean was washed and soaked in 630 ml water (bean:water, 1:3 w/v) overnight for 16 hours. Soaked soybean and 90 g lupine flour was then blended with 3L water (1:10,dry bean + flour : water) using speed 2 of Breville 5 speed blender (Model BLR 50) for 29 min. The slurry was used to obtain the extract hereafter called "milk". The milk was boiled for 5 minutes with occasional stirring followed by cooling to 78 °C. The coagulant solution suspension made by dissolving/mixing 15.0 g (0.3w/v of the milk) calcium sulphate in 20 ml distilled water was added and stirred properly. The coagulants were soluble in 20 ml water at room temperature. The mixture was let stand for 30 minutes for coagulation. The coagulated curd was transferred to a mould (22 cm x1715 cm x 12.5 cm), drained off the whey fraction gravimetrically for about 5 minutes and pressed for 45 minutes using a weight of 6 kg. The soy –lupine tofu was removed from the cheese cloth and was kept until using

Preparation of pies:

Pies were prepared according to the method described by Hassan and Salama (1990) with some modification. The ingredients in pies production are presented in Table (1).

For making pies, wheat flour was sifted and placed in a mixing bowl, then sugar, sesame, dry yeast and corn oil were added and mixed for one min. the required amount of water was added to form the dough. The dough was left for fermentation at 37 °C for 30 min. scale to appropriate weight to about 20 g. round up by folding in hand, molded and flatted dough ball to circle with semicircle to about 5 cm. about 4 g of date, tofu or mushroom and the edges were sealed. The pies were fermented for 30-40 min. at 37 °C and 85 % relative humidity. The pies were baked at 200°Cfor 15 min. The produced pies were cooled at room temperature before evaluation.

Table 1. The formula for preparing pies.

	Sample No.						
Ingredients (g)	control	1	2	3	4	5	6
Wheat flour 72%	100	80	80	80	75	75	75
Germinated sweet lupine flour	-	15	15	15	0	0	0
Germinated mung bean flour	-	0	0	0	15	15	15
Sweet lupine protein isolate		5	5	5	10	10	10
Sugar	3	3	3	3	3	3	3
Corn oil	20	20	20	20	20	20	20
Dry yeast	2	2	2	2	2	2	2
Salt	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Sesame	4.0	4	4	4	4	4	4
improver	1.0	1	1	1	1	1	1
Date	-	4	-	-	4	-	-
Mushroom	-	-	4	-	-	4	-
Tofu	-	-	-	4	-	-	4

Filling dough of pies (4gm of filling mushroom, tofu or date/20 gm dough) -Pretest experiment has been carried out to determine the best ratio of suggested materials for this study.

Physical characteristics of pies:

The moisture and water activity (aw) of the pies was measured using Rotronic Hygrolab 3 CH-8303, Switzerland as mentioned by**)** Cadden (1988)

- Protein, fiber, fat and ash were determined by (A.O.A.C.2005).

-Total carbohydrate was determined by difference by the following equation:

100 - (protein% +fat%+ ash%).

-Caloric value was calculated according to the following equation:

Caloric value = 4 (protein % +carbohydrate %) + 9 (fat%) FAO/WHO (1991)

-Determination of minerals content: minerals i.e. Zn, Mn, Fe, Ca and Mg were determined in the diluted solution of ash samples by using the atomic absorption spectrophotometer (3300 Perkin-Elmer) as described in A.O. A.C. (2005).

-Determination of amino acids:

-Amino acids were determined according to the method described by Winder and Eggum (1966) using a LC 3000 Amino Acid Analyzer Eppendrof- Germany.

-Protein Efficiency Ratio (PER) was estimated using the equation reported by Alsmeyer *et al.,* (1974) as follows

PER= 0.684 +0.456 (Leucine)- 0.047 (proline)

-Biological value (BV) was estimated using the equation by Mitchel and Block (1946) as follows: BV = 49.9 +10.53 PER.

- **Determination of vitamin D and vitamin B**

Vitamins content: vitamin D and vitamin B of pies were determined according to the method described by Xue *et al.,* (2008) and Batifourlier *et al,* (2005) respectively.

Sensory evaluation of pies:

The produced pies were evaluated for their sensory characteristics by ten panelists from staff of Bread and Pastry Res., Dept., Food Tech. Res. Institute, Agri. Res. Centre, Giza. The scoring scheme was mentioned by Hassan and salama (1990) as follow color (20), taste (20), odor(20), general appearance (20) and texture (20). The overall score 100 degrees.

Statistical analysis:

The obtained results for chemical composition, physical properties and sensory evaluation were statistically analyzed by the least significant difference value at 0.05 levels probability by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

Chemical composition of raw materials:

Data presented in Table (2) show the chemical composition of raw materials. It could be demonstrated that the germinated legumes flour (mung bean and sweet lupine) recorded high amount of protein and less decrease in fat, ash, crude fiber and carbohydrate compared with ungeminated legumes and wheat flour. The germination of legumes for 48 hr. after soaking led to increase the protein content and slight decrease in fat, fiber and ash content. The increment in protein content may be due to the biosynthesis of new protein or new enzymes required for germination or may be due to the consumption of the other stored components as reported by (Doweidar and Amer 2005). Also, protein isolate, tofu and mushroom have high content of protein and ash than wheat flour.

Table 2. Chemical composition of raw materials (on dry weight basis):

Sample	Protein %	Fat %	Ash %	Crude fiber %	Carbohydrate %	Calories Kcal/100g
Wheat flour72%	11.00^{g}	0.88^{h}	0.45^{h}	0.64^{i}	87.67^{b}	400.40^{a}
Un Germinated lupine flour	36.43^{c}	6.30^{a}	3.51^{c}	13.01^{a}	53.76^{g}	365.42^{h}
Germinated lupine flour	38.00^{b}	6.00^{b}	3.40^{d}	12.50^{b}	52.60^{h}	366.40^{g}
lupine protein isolate	92.00^{a}	1.00^{g}	1.02^{g}	1.10^{h}	5.98^{i}	396.52^{b}
unGerminated mung bean	26.30^{e}	1.40^{e}	4.20^{b}	5.43^{e}	68.10^{c}	368.48^{f}
Germinated mung bean	28.02^{d}	1.00f	4.00^{b}	5.02^{f}	66.98^{d}	368.92^{e}
Date	2.50^{h}	0.20i	1.40f	6.55^{d}	95.90^{a}	369.20^{d}
Mushroom	23.00f	5.20^{c}	7.10^{a}	7.30^{c}	64.70^{e}	368.48^{f}
Tofu	38.00^{b}	2.20^{d}	1.50^{e}	3.00^{g}	58.30^{f}	393.00^{c}
LSD	0.64	0.13	0.06	0.07	0.57	0.25

Each value within the same column is followed by the same letter or letters is not significantly different at ($p \leq 0.05$) n=3values

Mineral contents of raw materials:

Mineral contents of raw materials are very important components for food mixture. Calcium, iron, magnesium and zinc are the most important for physiological requirements of children. For example calcium is combined as the salts that give hardness to bones and teeth, iron is required for an expanding blood volume and increasing amounts of hemoglobin in growing children, magnesium is essential for all living cell, it is a catalyst in numerous metabolic reaction and zinc as an integral part of least 20 enzymes that belong to a large group known as metablo enzymes (Alamanous and Doxastakis 1997).

Data in Table (3) showed some minerals content i.e. zinc, manganese, iron, calcium and magnesium of the tested raw materials. It revealed that germinated legumes flour were extremely rich in minerals as compared with wheat flour. These results agreed with those found by Doweidar and Amer (2005).

Table 3. Minerals content (mg/100g) of raw materials used for the pies preparation

Sample	Fe	Ca	K	Mg	Zn	Mn
Wheat flour	1.8^{g}	36.0^{g}	126.9^{d}	113.1^{d}	0.51^{f}	1.02^{c}
unGerminated Sweet lupine flour	7.23^{c}	177.00^{b}	1011.00^{b}	270.00^{b}	5.21^{b}	2.33^{ab}
Germinated Sweet lupine flour	8.30^{b}	180.10^{a}	1023.00^{a}	277.00^{a}	7.21^{a}	2.33^{a}
Un Germinated Mung beanflour	4.90^{f}	135.00^{d}	0.21.00^{h}	0.10^{f}	0.55^{f}	0.25^{de}
Germinated Mung bean flour	5.50^{e}	138.00^{c}	0.21.00^{h}	0.20^{f}	1.00^{e}	0.31^{d}
Protein isolate	7.00^{c}	110.00^{f}	1001.00^{c}	200.10^{c}	0.53^{f}	2.00^{b}
Mushroom	49.0^{a}	26.00^{h}	32.00^{f}	6.00^{e}	3.00^{c}	0.32^{d}
Date	6.00^{d}	0.70^{i}	67.00^{e}	0.10^{f}	2.41^{d}	0.41^{d}
Tofu	1.10^{h}	130.00^{e}	0.55^{g}	6.00^{e}	0.23^{f}	0.10^{e}
LSD	0.24	0.20	0.18	0.15	0.33	0.17

Each value within the same column is followed by the same letter or letters is not significantly different at ($p \leq 0.05$) n=3values

Sensory evaluation of produced pies:

Sensory evaluation is considered as an important indicator of potential consumer preference.

With respect to sensory evaluation of pie samples, the presented data in Table (4). General appearance had the same value in all samples, significant decrease in taste when mung bean and tofu used in pies as a filler. Total score increased in supplemented pies except in samples no 3 and 6 compared with control sample. In general all supplemented pies were highly accepted (v. good).[i]

The obtained results in Table (4) showed that the highest values for all sensory characteristics were observed for supplemented pies with sweet lupine and filling with date and mushroom sample no. 1,2,4,5.

Table 4. Sensory evaluation of produced pies.

Sample	General appearance (20)	Taste (20)	Odor (20)	Color (20)	Texture (20)	Total score (100)	Acceptance
Control	19.0^{a}	18.2^{c}	19.0^{c}	19.5^{b}	18.5^{a}	94.2^{d}	V. good
Sample (1)	19.0^{a}	20.0^{a}	19.7^{a}	20.0^{a}	18.5^{a}	97.2^{a}	V. good
Sample (2)	19.0^{a}	19.2^{b}	19.0^{c}	18.5^{c}	18.5^{a}	94.2^{d}	V. good
Sample (3)	19.0^{a}	17.2^{d}	19.0^{c}	18.5^{c}	18.5^{a}	92.2^{e}	V. good
Sample (4)	19.0^{a}	20.0^{a}	19.6^{b}	20.0^{a}	18.5^{a}	97.1^{b}	V. good
Sample (5)	19.0^{a}	19.2^{b}	19.6^{b}	18.5^{c}	18.5^{a}	94.6^{c}	V. good
Sample (6)	19.0^{a}	17.2^{d}	19.0^{c}	18.5^{c}	18.5^{a}	92.2^{e}	V. good
LSD	0.06	0.53	0.54	0.48	0.83	0.25	-

Sample 1,4: pie with date, sample 2,5:pie with mushroom, sample 3, 6: pie with tofu
Each value within the same column is followed by the same letter or letters is not significantly different at ($p \leq 0.05$) n=3values

Physical characteristics of pies:

Moisture content and water activity (aw) of pies:

Water is an important substance present in all foods which contributes to food texture, structure stability, palatability and overall quality. Its content is a very important factor controlling the rate of food deterioration which in turn has an additional effect on the shelf life of intermediate –moisture foodstuffs. Cadden (1988).

Table (5) represents the moisture and water activity of pies. Data revealed that the moisture of pies samples significantly differ compared to control sample. Sample (3) recorded the maximal moisture (36.5 %) in all investigated samples followed by sample (6) which had 33.1 % water. This may be due to the highest water content in

filler material (tofu) which used in these samples, in comparing control sample which recorded the minimal content (25.4 %)

Water activity Is a measurement of the availability of water for biological reaction. It determines the ability of microorganisms to grow. It has already been identified as an intrinsic factor in determining the safety or shelf life of a product. Table (6) represents aw of the pies. Data revealed that aw values of the different pies samples significantly varied where sample (6) recorded the highest aw (0.91) followed by samples (3 and 2) 0.85 and 0.81 respectively compared to the control sample (0.70), this may be related to their water content. Accordingly, aw values of all samples were considerably low and safe.

Water activity is a particularly important factor influencing spoilage of many bakery products such as breads, pies and cakes has levels above 0.94. from the above mentioned results about water activity it could predict the stability and keeping safely and prepared pies where control sample, sample (1), sample 4,5, sample (2), 3 and sample 6 are considered non potentially hazardous because they had water activity less than 0.95. Cadden (1988).

Table 5.water content and water activity (aw) of produced pies.

Sample	Moisture %	Water activity (aw)
Control	25.40^{ab}	0.70^{f}
Sample (1)	25.90^{c}	0.77^{e}
Sample (2)	27.50^{bc}	0.81^{d}
Sample (3)	36.50^{ab}	0.85^{a}
Sample (4)	27.50^{bc}	0.80^{d}
Sample (5)	27.60^{bc}	0.80^{c}
Sample (6)	33.10^{a}	0.91^{b}
LSD	0.73	0.50

Sample 1,4: pie with date, sample 2,5:pie with mushroom, sample 3, 6: pie with tofu-
Each value within the same column is followed by the same letter or letters is not significantly different at ($p \leq 0.05$) n=3values

Chemical composition of produced pies:

An adequate knowledge of the chemical composition of food is vital to the health, well-being and safety of the consumer. The results in Table (6) showed that significant difference between all supplemented samples and control one. All supplemented samples had the highest value of protein, fat, ash and crud fiber while decrement in carbohydrate. The protein ranged from 18.39-23.8 %, fat ranged from 11.43-12.15 % ash 2.05-3.06 %, crude fiber 3.01-3.41 %, while control pie had only 8.5% protein, 10.65% fat, 1.4 % ash, 1.51 % fiber.

Table 6. Chemical composition of pies samples (on dry weight basis)

Sample	Protein %	Fat %	Ash %	Crude fiber %	Carbohydrate %	Calories Kcal/100g
Control	8.50^{e}	10.65^{c}	1.40^{c}	1.51^{e}	79.45^{a}	441.60^{a}
Sample (1)	18.39^{d}	11.43^{b}	2.05^{b}	3.16^{c}	68.13^{b}	436.31^{d}
Sample (2)	19.20^{c}	11.57^{b}	2.08^{b}	3.21^{b}	67.15^{c}	436.69^{c}
Sample (3)	19.00^{C}	12.15^{a}	2.06^{b}	3.01^{d}	66.79^{d}	440.47^{b}
Sample (4)	22.99^{b}	11.43^{b}	2.05^{b}	3.36^{a}	63.53^{e}	435.51f
Sample (5)	23.80^{a}	11.57^{b}	2.08^{b}	3.41^{a}	62.55^{f}	435.89^{e}
Sample (6)	23.60^{a}	11.43^{b}	3.06^{a}	3.23^{b}	61.91^{g}	431.99^{g}
Sample (6)	0.44	0.39	0.29	0.06	0.19	0.07

Sample 1,4: pie with date, sample 2,5:pie with mushroom, sample 3, 6: pie with tofu.
Each value within the same column is followed by the same letter or letters is not significantly different at ($p \leq 0.05$) n=3values

Minerals content of pies:

Data in Table (7) showed that all supplemented pies had increment values of minerals content i.e. iron, calcium, manganese, zinc, magnesium and potassium. Hence supplemented and filling pies are favorable than control one because of their high content of important minerals. These results agreed with those reported by Doweidar and Amer (2005).

Table 7. Minerals content (mg/100g)of prepared pies.

Sample	**Fe**	**Ca**	**K**	**Mg**	**Zn**	**Mn**
Control	1.30^{f}	19.90^{g}	118.21^{e}	110.0^{f}	1.42^{d}	0.94^{b}
Sample (1)	5.50^{c}	28.00^{f}	129.11^{a}	150.10^{e}	1.96^{c}	0.96^{b}
Sample (2)	7.60^{a}	30.00^{e}	119.13^{d}	151.20^{d}	2.99^{a}	0.97^{b}
Sample (3)	3.70^{e}	47.80^{b}	120,11^{b}	161.10^{b}	2.31^{b}	1.00^{b}
Sample (4)	5.83^{b}	33.51^{d}	129.10^{a}	160.21^{c}	1.99^{c}	1.51^{a}
Sample (5)	7.91^{a}	35.10^{c}	119.63^{c}	161.30^{b}	3.12^{a}	1.06^{b}
Sample (6)	4.10^{d}	52.10^{a}	120.60^{f}	172.30^{a}	2.33^{b}	1.10^{b}
LSD	0.29	0.27	0.09	0.31	0.24	0.28

Sample 1,4: pie with date, sample 2,5:pie with mushroom, sample 3, 6: pie with tofu-
Each value within the same column is followed by the same letter or letters is not significantly different at ($p \leq 0.05$) n=3values

Vitamins content of pies:

Table (8) presented vitamin B12 and vitamin D µg/ 100g of pies. It could be noticed that vitamin B12 in supplemented pies was increased from 3.8 to 7.66 times as that in control pies. Also, vitamin D was increased 2.9 to 4.05 times as that in control pie. Hence supplemented and filling pies are favorable than control one because of their high content of important vitamins. These results agreed with those reported by (Walid and Richard 2003) & Mallikarjuna *et al.,* (2013).

Table 8. vitamins content (µg/100g)of prepared pies.

Sample	Vitamin B12	Vitamin D
Control	0.06	19.5
Sample 1	0.44	58.5
Sample 2	0.43	61.5
Sample 3	0.23	75.0
Sample 4	0.46	63.0
Sample 5	0.44	66.0
Sample 6	0.24	79.5

Sample 1,4: pie with date, sample 2,5:pie with mushroom, sample 3, 6: pie with tofu

Amino acids content of pies samples:

Protein quality is partially dependent upon its amino acid profile. Table (9) shows that amino acids analysis of various prepared pies. Results show that all filling pies had the highest quality of essential amino acids especially lysine which is the first limiting amino acid in cereal products and total non essential amino acids such as arginine, asparatic, glycine and alanine compared to those in control pie. The protein efficiency ratio (PER) and biological value (B.V) of filling pies were higher than control sample. The essential amino acid leucine, methionine, cystine and phenyl alanine are higher than FAO/WHO reference pattern (FAO/WHO 1991). These results agreed with Mallikarjuna *et al.,* (2013) who mentioned that mushroom is rich in amino acids. Also certain combination of cereal and legumes can be very desirable from nutritive stand point. Legumes are good sources of lysine and total protein than cereals, while cereals represent superior sources of sulfur containing amino acids. Therefore the amino acids balance could be improved by preparing some blends of both Doweidar and Amer (2005).

Table 9. amino acids content of favorable pies with high content of protein as compared with control (gm A.A /100 gm protein).

Amino acids (A.A.)	Control	Sample 4	Sample 5	Sample 6	FAO/WHO 1991
Essential	Amino acids	E.A.A.			
Lysine	2.01	4.4	4.6	4.2	5.8
isoLeucine	4.2	5.7	5.7	6.1	2.8
leucine	6.1	6.6	8.07	7.0	6.6
Methionine + cystine	3.8	3.1	3.26	3.48	2.5
Phenyl alanine +tyrosine	7.3	8.5	8.28	8.0	6.3
Threonine	3.2	3.4	3.8	3.5	3.4
valine	4.6	4.7	5.4	5.2	3.5
tryptophan	-	-	-	-	1.1
Total EAA	31.2	36.4	39.11	37.48	33.9
Non Essential Amino Acids					
Histidine	1.90	2.37	2.49	2.4	
Arginine	3.07	5.56	5.56	5.6	
Asparatic	5.12	6.67	6.65	7.4	
Serine	5,6	5.6	5.62	5.5	
Glutamic	32.1	24.91	24.89	24.9	
Proline	11.2	9.22	7.28	7.5	
Glysine	3.75	4.41	4.1	4.0	
Alanine	3.28	3.5	3.32	3.3	
Total N.E. A.A	66.02	58.74	59.91	60.6	
PER	2.94	3.26	4.02	3.53	
B.V.	80.85	84.23	92.27	87.1	

Sample 1,4: pie with date, sample 2,5:pie with mushroom, sample 3, 6: pie with tofu

Percentage of the recommended daily allowances (RDA %) provided from produced pies:

The percentages of the recommended dietary allowances (RDA %) are provided from 100 g of produced pies for children and adults (males and females) are showed in Table (10,11and 12) respectively. It could be observed that all values of RDA % for protein, minerals (Fe, Zn, Ca and Mg) and vitamins content (D and B12) were high in all samples of supplemented filling pies compared with control pie. This increment in RDA % was attributed to the high content of protein, minerals and vitamins in legumes (mung bean and sweet lupine) and the filling nutrients date, tofu and mushroom.

Table 10. percentage of the RDA for some nutrient provided from 100 g pies for children (4-8) years.

RDA* 1989	Control	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
Protein (19g)	44.7	96.7	101	100	121	125.26	124.21
Fe (10mg)	13.0	55.0	76	37	78.0	79.0	70.0
Ca (800mg)	2.48	3.5	3.75	5.97	7.4	8.25	7.87
Zn (5µg)	28.4	39.2	59.8	46.2	4.2	62.0	45.2
Vitamin D(15µg)	1.3	3.9	4.1	5.0	4.2	4.4	5.3
Vitamin B12 (1.2)µg	0.05	0.37	0.36	0,19	0.38	0.37	0.2

Sample 1,4: pie with date, sample 2,5:pie with mushroom, sample 3, 6: pie with tofu
RDA* Recommended daily allowances from the Daily Reference Intake according to Food and Nutrition Board as reported by National Academy of Sciences (2004
RDA%: value of nutrient in sample of pies x 100 /RDA for the same nutrient in reference

Table 11. percentage of the RDA for some nutrient provided from 100 g pies for male (14-18) years.

RDA* 1989	Control	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
Protein (52g)	16.34	35.36	36.92	36.54	44.2	45.76	45.38
Fe (12mg)	10.8	45.83	63.35	30.83	65.0	66.58	58.4
Ca (1300mg)	1.53	2.15	2.3	3.68	12.33	12.64	13.62
Zn (11mg)	12.9	17.81	27.18	21.0	19.09	28.18	20.55
Vitamin D(15µg)	8.66	27.0	26.0	33.0	28.0	29.33	35.4
Vitamin B12 (2.4µg)	4.1	30.0	30.83	15.83	30.83	31.66	16.6

Sample 1,4: pie with date, sample 2,5:pie with mushroom, sample 3, 6: pie with tofu
RDA* RDA* Recommended daily allowances from the Daily Reference Intake according to Food and Nutrition Board as reported by National Academy of Sciences (2004)
RDA%: value of nutrient in sample of pies x 100 /RDA for the same nutrient in reference

Table 12. percentage of the RDA for some nutrient provided from 100 g pies for female 14-18 years.

RDA* 1989	Control	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
Protein (46g)	18.47	39.97	41.73	41.3	49.97	51.73	51.3
Fe (15mg)	8.66	36.66	50.66	24.66	65.0	53.26	46.73
Ca (1300mg)	1.53	2.15	2.3	3.68	12.33	12.64	13.62
Zn (9mg)	15.77	21.77	33.22	25.6	19.09	34.4	25.11
Vitamin D(15µg)	8.66	27.0	26.0	33.0	28.0	29.33	35.4
Vitamin B12 (2.4µg)	4.1	30.0	30.83	15.83	30.83	31.66	16.6

Sample 1,4: pie with date, sample 2,5:pie with mushroom, sample 3, 6: pie with tofu

RDA* Recommended daily allowances from the Daily Reference Intake according to Food and Nutrition Board as reported by National Academy of Sciences (2004)

RDA%: value of nutrient in sample of pies x 100 /RDA for the same nutrient in reference

The economic evaluation of pies:

Cost production of the tested pies was found in Table (14). It could be noticed that the highest cost was found in samples no. 1 and 5 comparing with control pie. The cost increment in some products could be justified to consumer by the increment of the potential health benefits.

Table 13. Economic cost of produced pies for 1 Kg flour

Sample	Amount (g)	Cost(pt)	control	1	2	3	4	5	6
Wheat flour	1000	500	500	485	485	485	485	485	485
Sweet lupine flour	1000	900	-	135	135	*135*	90	90	90
Mung bean	1000	800	-	80	80	80	40	40	40
Sweet lupine milk	500	200	-	25	25	25	25	25	25
Protein isolate	500	850	-	42.5	42.5	42.5	85	85	85
Date	300	300	-	300	-	-	300	-	-
mushroom	300	700	-	-	700	-	-	700	-
tofu	300	350	-	-	-	350	-	-	350
A+B	-	-	598.5	598.5	598.5	598.5	598.5	598.5	598.5
Net cost for 1kg flour (pt)	-	-	1098.5	1666	2066	1713	1623.5	2023.5	1673.5
Net cost of 1kg pie(pt)	-	-	732.3	923.5	1147.5	951.6	901.9	1124.2	929.7
Rate increasing of pie cost %	-	-	-	26	56.7	29.9	23.3	53	26.9

Other ingredients: sugar 100g, corn oil 100g, dry yeast 20 g, salt 7.5 g,10 g sesame and improver 10 g

The cost of the previous ingredient (A)= 100+100+90+2+5+1.5=298.5pt

B=The cost of production =300 pt. A+B=598.5

CONCLUSION

From this study it could be concluded that incorporated of germinated sweet lupine flour, germinated mung bean flour and lupine protein isolate in formulating pies and filling with date, mushroom or tofu caused rising the nutrition value such as protein, minerals and vitamins content. New prepared pies could be recommended as a food aid in feeding programs for pupils in different school stages and adults especially the vegetarian person. In addition to these pies prepared easily at home as healthy diets.

REFERENCES

1. -Alamanous, S. and Doxastakis, G. 1997. Effect of wet extraction methods on the emulsifying and foaming properties of lupine seed protein isolates (lupineus albussp. Graecus). Food Hydro. 11, (4):409-413.
2. Allen N, Appleby P, and Davey G. 2000. Hormones and diet: low insulin-like growth factor-1 but normal bioavailable androgens in vegan men. British Journal of Cancer 83 (1): 95–7.
3. Alsmeyer, R. H., Cunhingham, A. E. and Happich, M. L. 1974. Equation predict PER from amino acid analysis. Food Tech., 28 (7):34-40.
4. American Dietetic Association. 2003. Position of the American Dietetic Association and Dietitians of Canada: vegetarian diets. Journal of the American Dietetic Association 103 (6): 748–62.
5. A.0.A.C. 2005. Association of Official of Analytical Chemists, Official Methods of Analysis. 18th Dd., Pub. by the A.O.A.C., Arlington, Virginia,2220 USA.
6. Appleby P, Davey G and Key T. 2002. Hypertension and blood pres-sure among meat eaters, fish eaters, vegetarians and vegans in EPIC- Oxford. Public Health Nutrition (5): 645–54.
7. Batifourlier , F. M. A., Verny, C., Besson, C., Demigne and Remesy, c. 2005. Journal of Chromatography B, 816: 67-72.
8. Cadden, A. M. 1988. Moisture sorption characteristics of several food fibers. J. Food Sci., 53 (4): 1150-1155.
9. Camacho L[1], Sierra C, Campos R, Guzmán E and Marcus D. 1992. Nutritional changes caused by the germination of legumes commonly eaten in Chile. Arch Latinoam Nutr. 42(3): 283-290.
10. Doweidar, M. M. and Amer, T. A. 2005. Production and evaluation of highly protein bakery products by using legumes. Annals of Agric. Sci., Moshtohor, 43 (4): 1779- 1795.

11. FAO/WHO. 1991. Protein Quality Evaluation. Reports of a join FAO/WHO expert Consultion, Food and Agriculture Organization of the United Nations, FAO, Rome. Pp 1-66.
12. Jayasena, V., Khuws W. S. V. and Nasar-Abbasn, J. 2010. The development and sensory acceptability of lupine based tofu. Journal of Food Quality. 33 (1): 85–97.
13. Hassan, E.M. and Salama, M. F. 1990. Evaluation of wheat pies supplemented with different plant protein sources. Bull. Nat. Nutr. Inst. Cairo, Egypt, 10 (1): 60-73.
14. Mallikarjuna, E. A. Ranjini, Devendra J. Haware, M. R. Vijayalakshmi, M. N. Shashirekha,1 and S. Rajarathnam. 2013. Mineral Composition of Four Edible Mushrooms. Journal of Chemistry Volume 2013 (2013), Article ID 805284, 5 pages
15. Mitchel, H. H. and Block, J. 1946. The correlation of amino acid composition of protein with their nutritive value. Nutrition Abstracts and Reviews, 16 (2): 249-278.
16. National Academy of Sciences. 2004. Dietary references Intakes (DRI) Estimated average Requirements Food and Nutrition Board, Institute of Medicine, National Academies as reports by accessed via http://www.nap.edu.
17. Snedecor, G. W. and Cochran, W. G. 1980. Statistical methods 7th ed. Iowa State Univ., Press. Ames., Iowa, USA.
18. Walid, A. and Richard J. M. 2003. The fruit of the date palm: its possible use as the best food for the future? Int. J. Food Sci. Nutr. 54 (4): 247-259
19. Winder, K. and Eggum, O. B. 1966. Protein hydrolysis Adescription of the method used at the department of animal physiology in Copenhagen Acta Agriculture Scandinavia, 16: 1115
20. Xue, X., You, J. and He, P. 2008. Simultaneous determination of five fat- soluble vitamins in feed by high –performance liquid chromatography following solid – phaase extraction. Journal of chromatographic Science, vol 46, April, 2008.

إعداد و تقييم بعض الفطائر المدعمة للنباتيين

هدى حسن أبوالسعود حافظ

معهد بحوث تكنولوجيا الاغذية – مركز البحوث الزراعية–الجيزة–مصر

نظرا لتزايد أعداد الاشخاص النباتيين فى الأونة الأخيرة وذلك لأسباب صحية وإقتصادية لذا كانت هذة الدراسة محاولة لإنتاج فطائر محسنة لمقابلة الإحتياجات اليومية الموصي بها وذلك بتدعيم دقيق القمح بدقيق العدس الصيفى المنبت و دقيق الترمس الحلو المنبت وكذلك البروتين المعزول من الترمس بالأضافة لاستخدام البلح والمشروم والتوفو المحضرمن (الصويا ودقيق الترمس) كل على حده لحشو الفطائر كمصادر غنية بالبروتين و الفيتامينات والمعادن .

تم تقييم الفطائر المنتجة كقيمة غذائية و الخواص الطبيعية و الحسية و التكلفة الأقتصادية. وجد ان جميع الفطائر المدعمة هى الأعلى فى البروتين و الدهن و الرماد و الألياف الخام فقد احتوت العينة الكونترول على٥و٨%بروتين بينما تراوح البروتين بين ٣٩و١٨ –٨و ٢٣ %للعينات المدعمة٠ أيضا كانت الفطائر المدعمة الأعلى فى الحديد والكالسيوم و الزنك و البوتاسيوم و الفيتامينات بالمقارنة بالكونترول٠ فقد كان الحديد و الكالسيوم ٣و١&٩و١٩ملجم/ ١٠٠جم بالتتابع للعينة الكونترول بينما تراوح الحديد بين ١و٤–٩١و٧ملجم\ ١٠٠جم و الكالسيوم بين ٢٨–١و٥٢ملجم /١٠٠جم للعينات المدعمة ٠ أظهر التقييم الحسى أن الفطائر المدعمة و المحشوة كانت مقبولة حسيا خاصة تلك المحتوية علي دقيق الترمس الحلو و المحشوة بالبلح أو المشروم بالأضافة الي تزايد الاحماض الامينية الأساسية بالمقارنة بالكونترول٠ وتبعا لذلك فقد تزايدت القيمة الحيوية للفطائر المدعمة٠ و كذلك كانت كل أنواع الفطائر المدعمة والمحشوة الاعلى فى تغطية معظم الإحتياجات اليومية الموصي بها للمغذيات المدروسة السابقة للأطفال و البالغين مقارنة بالكونترول٠ وتراوح معدل الزيادة فى التكلفة الأقتصادية بين ٣و٢٣ %إلى ٧و٥٦ % . لهذا نوصى بالفطائر كمنتج عالى القيمة الغذائية لتغطية الأحتياجات اليومية٠