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Preparation of Vegan Omelet from Non-Traditional Formulae

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Abstract

This study aims to prepare vegan omelet -free from animal components and their derivatives- suitable for vegans and children who suffer from eggs allergy. Formulae were cooked from chickpea and cowpea as protein sources by using different substitution rates beside other constant ingredients. Proximate chemical composition of raw materials and cooked formulae was determined. Sensory evaluation of all cooked formulae was estimated. The results indicated that chickpea had high content in protein, Na, Ca and P, while cowpea is the richest in protein, K and Mg contents. Generally, all raw materials had high content in total carbohydrates and low content in crude fat and total energy. The results showed all vegan omelet formulae were acceptable by the sensory evaluation panel with different significant degrees. The results showed the possibility of producing vegan omelet had a good nutritive value, easy to prepare, appropriate for people with low income and dependent on low-calorie evaluation.

Key words: Vegans, Vegan omelet, Protein quality, Amino acids, Sensory evaluation.

Introduction

Vegetarian diets are associated with reduced risk of many diseases in health-conscious individuals. The major problem with recommending vegetarian diets for improving health is that a vegetarian diet is inadequately defined in terms of nutrient and food contents. Following the vegetarianism is not only eating plant origins but also formulating a balanced vegetarian diet **(Tharanathan and Mahadevamma, 2003).** Basically, variations of vegetarian diets were classified into: 1) lacto-ovo-vegetarians (includes dairy and eggs), 2) lacto-vegetarians (includes dairy), 3) ovo-vegetarians (includes eggs),

and 4) vegan which have further restrictions imposed and exclude all animal origin foods. Additionally, vegetarians are characterised by high consumption of fruit, vegetables, legumes, nuts, grains and soy protein-food components, and each of these may independently be associated with positive health outcomes (**Craig and Mangels, 2009; McEvoy et al., 2012; Messina, 1999** and **Hunt, 2003**). Interestingly, the meat substituting industry was highly encouraged to reduce the meat consumption and thereby reduce the risk of related disease. Purely, substituting consumption of meat by alternative protein rich products made from plant proteins, so-called Novel Protein Foods, would be an attractive option (**Jongen and Meerdink, 2001)**. The University of Oxford suggests that a vegetarian diet could significantly reduce people's risk of heart disease, finding that vegetarians have up to 32% less risk of developing heart disease than comparable to non-vegetarians (**Fraser, 2009; Jakszyn et al., (2011)** and **Sacks and Kass, 1988**). This finding could encourage the processed meat consumers to change their nutritional behavior and prevent themselves from 42% higher risk of heart disease, a 19% higher risk of type 2 diabetes and bladder cancer as mentioned by (**McEvoy et al., 2012 and Micha et al., 2010**). The Egyptian cuisine is notably conducive to vegetarian diets, as it relies heavily on vegetable dishes. However, several commonly consumed vegetables such as chickpea, cowpea, green pea, onion and tomato were favorable for Egyptian consumers over the years ago. There are many studies that review the health benefits of mentioned vegetables considering their phytochemicals content and potential antioxidant, antimutagenic, anticarcinogenic, antimicrobial activities **(Świątecka et al., 2010; Nilsson et al., 2004; Mitchell et al., 2009; Limón et al., 2014 and Doria et al., 2012)**. Indeed, carefully planned vegetarian and vegan diets can provide adequate nutrients for optimum health **(Craig and Mangels, 2009)**. Evidence suggests that infants and children can be also successfully reared on vegan and vegetarian diets **(Mangels and Messina, 2001** and **Messina and Mangels, 2001)**. Generally, legumes have been reported to have low nutritive value because of low amounts of sulfur-containing amino acids, low protein digestibility and the presence of anti-nutritional factors. Legumes are usually cooked before being used in the human diet. This improves the protein quality by destruction or inactivation of the heat labile anti-nutritional factors (**Chau et al., 1997 and Wang et al., 1997**).

The present work was carried out to investigate the possibility to prepare vegan omelet from different vegetables incorporated with chickpea and cowpea as protein source. Proximate chemical composition, minerals, amino acids compounds and the organoleptic evaluation for cooked diets were carried out.

Materials And Methods

Materials

Chickpea (*Cicer arietinum*), cowpea (*Vigna unguiculata*) and rice (*Oryza sativa*) were obtained from Field Crops Research Institute (FCRI), Agricultural Research Center (ARC), Ministry of Agriculture, Giza, Egypt. Tomato, carrot, onion, garlic, sagebrush, coriander, parsley, green pepper, wheat flour 72% extraction, salt, baking powder and black pepper were obtained from the local market at Giza, Egypt.

Methods

Preparation mixtures of vegetables:

Chickpea, cowpea and rice were soaked in tap water (1:10, w/v) for 12 h at room temperature (25 °C). The soaked seeds were drained and rinsed three times with 600 mL tap water. They were homogenized with other ingredients at fixed rates as indicated in Table (1) using a Waring blender (VWR) to prepare vegan formula. The vegan formulae were placed in trays and cooked in the oven at 180 °C for 20 minutes to produce different formulae of vegan omelet.

Preparation formulae to chemical analysis

Formulae were homogenized in a Waring blender (VWR), dried at 50°C for 12 hours and then ground in a Cyclotec (Tecator 1092) mill with an 80 mesh.

Table (1): The suggested mixtures composition of vegan omelet (g/100g)

Raw materials	Formulae number				
	1	2	3	4	5
Chickpea	50.00	37.50	25.00	12.50	-
Cowpea	-	12.50	25.00	37.50	50.00
Rice	10.00	10.00	10.00	10.00	10.00
Wheat flour 72%	8.50	8.50	8.50	8.50	8.50
Tomato	5.00	5.00	5.00	5.00	5.00
Carrot	5.00	5.00	5.00	5.00	5.00
Onion	5.00	5.00	5.00	5.00	5.00
Green pepper	5.00	5.00	5.00	5.00	5.00
Garlic	2.50	2.50	2.50	2.50	2.50
Coriander	2.50	2.50	2.50	2.50	2.50
Parsley	2.50	2.50	2.50	2.50	2.50
Sagebrush	2.00	2.00	2.00	2.00	2.00
Salt	1.00	1.00	1.00	1.00	1.00
Black pepper	0.50	0.50	0.50	0.50	0.50
Baking powder	0.50	0.50	0.50	0.50	0.50

Analytical methods:

Proximate composition analysis

Moisture, crude protein, fat, ash and crude fiber were determined by using the standard methods (**AOAC, 2010**). Total fat content was obtained by the Soxhelt extraction method. Protein was determined by Kjeldal procedure; the factor N×6.25 was used to convert total nitrogen into crude protein. Data were expressed as percent of dry weight (DW). The carbohydrates calculated by difference [100 – (fat + protein + ash + fiber)].

Minerals analysis

Na, K, Ca, Mg, P, Fe, Zn and Cu were determined by atomic absorption spectrometer (Chemtech CTA-2000, England). Samples were digested by dry ashing and dissolved in 1M HCl. Phosphorus content was determined colorimetrically according to the standard method (**AOAC, 2010**).

Nutritional evaluation of proteins

Amino acids were determined according to the method of **Becker et al. (1981)** by using amino acid analyzer (Beckman amino acid analyzer, Model 119 CL). Tryptophan content was determined colorimetrically according to the method of **Blouth et al., (1963)**. The indices were determined by mathematical formula according to **Hidvegi and Bekes (1985)** as following: Chemical score of essential amino acids were calculated using the equation of **Pellet and Young (1980)**.

CS= 100 × Min (ai, sample/ai, ref.).

Protein efficiency ratio (PER) was estimated by using the equation of **Alsmeyer et al., (1974)**.

PER= -1.816 + 0.435 (Methionine) + 0.78 (Leucine) +0.211(Histidine) – 0.944(Tyrosine)

Biological value (BV) was calculated by using the equation of **Mitchell and Block (1946)**. BV = 49.9 + 10.53 (PER)

Organoleptic evaluation

The quality of formulae was evaluated by twenty panelists from the staff of Food Technology Research Center (FRTI), Agricultural Research Center (ARC), Giza, Egypt. Tested samples were evaluated for color, odor, taste, texture and general appearance by ten grades. The evaluation was accomplished according to the method of **Tassan and Ressell (1975).**

Statistical analysis

Organoleptic results were expressed as the mean ± SD. The obtained data were statistically analyzed using the SPSS-PC statistical package software, version 11.0. One-way analysis (ANOVA) was used according to **Duncan (1996).**

Results And Discussion

Proximate analysis of raw materials

The proximate composition of raw materials (on dry weight basis) namely; chickpea, cowpea, rice, wheat flour 72% extraction, tomato, carrot, onion, green pepper, garlic, coriander, parsley and sagebrush are given in Table (2). The results showed that cowpea contain the highest protein value (28.79%) followed by chickpea (23.69%). Total carbohydrates content were higher in the rice and wheat flour 72% extraction being 89.63% and 83.56%, respectively. Moreover, sagebrush had the highest value in fat content which recorded 8.70%. Ash content gives an indication of the mineral content in different raw materials. Ash percentages ranged from 0.40 to 12.29 % in raw materials. The previous results are in agreement with those obtained by **Jongen and Meerdink (2001)**.

Minerals composition of raw materials

Different minerals play an important role about the nutritional point of view. The results in table (3) showed that raw materials contain relatively moderate rates of different minerals in mg/100g on dry weight basis. It could be observed that chickpea contain the highest amount of Na (66.00 mg/100g) and P (380.00 mg/100g); cowpea contains the highest amount of K (1213.00 mg/100g) and Mg (136.00 mg/100g) while sagebrush had the highest amount of Ca (145.00 mg/100g), Fe (27.85 mg/100g) and Zn (4.55 mg/100g).

Sensory evaluation of different vegan formulae

Sensory evaluation of food products is an important criterion by which its consumer acceptability can be assessed. Table (4) shows the sensory evaluation for different formulae substituted with whole flaxseeds flour. Generally, all vegan omelet formulae were acceptable with different significantly degrees by the sensory evaluation. Formula no. 3 get the highest general appearance score (9.25). Furthermore, formulae 1, 2, and 3 had the highest taste score (9.25). Statistical analysis showed significant ($p \leq 0.05$) decreases in color, taste and

general appearance attribute with the increase in the percentage of added cowpea. This result may be due to the color of cowpea flour which has dark color. Moreover, the overall acceptability scores indicated that the different formulae could be arranged as formula 3 > formula 1 > formula 2 > formula 4 > formula 5.

Proximate composition of the different cooked formulae

Proximate composition of cooked formulae was presented in Table (5). The results show five cooked formulae had good values in protein and total carbohydrates in formulae 1 and 5 ranged from 18.20% to 20.85% and from 66.26% to 67.56%, respectively. While all formulae had low values in fat and total energy ranged from 2.23% to 4.58% and from 368.51 Kcal to 384.36 Kcal, respectively. The variations in the proximate composition could be attributed different substitution rates between chickpea and cowpea that rich in proteins and carbohydrates. The results are in accordance with those reported by **Tharanathan and Mahadevamma (2003).**

Minerals content of the different cooked formulae

Results in Table (6) indicated that minerals content of the cooked formulae showed higher contents of K, Ca, P, Na, Mg, Fe, Zn and Cu. The highest values of minerals in formulae of present work raised the nutritive values of cooked formulae. Hence, formulae cooked with chickpea, cowpea and rice were favorable and recommending their use as a good source of minerals in human foods. These results are in agreement with those of (**Radi et al., 2006**). Consumption of foods rich in micronutrients and phytochemicals has been associated with good health. Sodium and phosphorous enhance fluid balance and nerve impulse transmission. Potassium ensures muscle cell contractility. Deficiency of phosphorus decreased growth, poor tooth development, and rickets (**Okwu and Orji, 2007 and Vadivel and Janardhanan, 2000).** Formulae made from these components can furnish the body with significant amounts of these nutrients that can contribute effectively to meeting the daily recommended intake of the various nutrients.

Essential amino acids contents of the more acceptable cooked formula (No.3) (g/16gN) compared with the FAO/WHO/UNU (1985) reference

The protein quality of food depends on its amino acids content and the physiological utilization of specific amino acid after digestion,

absorption and utilization. Data presented in Table (7) showed the amino acids contents of cooked formula 3 which had the highest score in sensory evaluation. Results showed that formula 3 had the high values in essential amino acids such as (phenylalanine + tyrosine) (5.93%), leucine (5.87%) and lysine (5.48%), good source of valine (3.43%), isoleucine (3.22%) and therionine (3.16%), and low sources from tryptophane (0.78%) and (methionine + cysteine) (1.88%). These results are in line with that reported by **Evans and Boulter (1980)** that cowpea and chickpea proteins are rich in leucine, isoleucine and lysine and poor in methionine and tryptophane. Furthermore, the chemical score of cooked formula 3 is listed in the same Table. Amino acid score is very important to evaluate the content of essential amino acids in foods and also to cover the nutritional requirements of proteins. Cooked formula 3 rich in protein content (19.53%) and contain considerable amounts of essential amino acids (32.34%). Data showed the highest chemical scores of children and adults were histidine (136.42) and lysine (304.17), respectively. Based on chemical score, the first and second limiting amino acids were tryptophan (70.91) and sulfur-containing amino acids (methionine + cysteine) that being 75.20, respectively while for adults, the limiting amino acids was (methionine + cysteine) that being 93.75. These results agree with **Chau et al., (1997)** who reported that legumes have low amounts of sulfur-containing amino acids. As well, **Khalil and Mansour (1995)** reported that cooking reduced sulfur-containing amino acids and tryptophan.

Protein efficiency ratio and biological values

The values of PER and BV of vegan omelet formula 3 proteins are presented in Table (8). The PER and BV of formula 3 proteins were found to be 1.83 and 69.17, respectively. Results showed that PER and BV values were low by simple than those in casein, indicating that PER and BV proteins are of high nutritional value. This could be attributed to the reduction of certain essential amino acid content, particularly tryptophan, cysteine and methionine Results are agreement with **Mune et al., (2012).** The inclusion of pulses in cereal based food is known to increase the nutritive value by improving protein content **(Abou Arab et al., 2010)**. Generally, it could be concluded that chickpea, cowpea, rice and wheat flour 72% extraction are of favorable amino acids balance,

and considered a good source of protein, and is worthy to be incorporated into cereal products such as vegan omelet.

Economic evaluation

The cost of different raw mixtures (per kilogram) used for producing vegan omelet formulae was showed in Table (9). It could be noticed that the lowest cost (4.80 LE) was for formula 1 that containing 50% of cowpea and without chickpea. While the formula 1 that containing 50% of chickpea and without cowpea had the highest cost (5.80 LE). It could be observed that, the cost of raw formulae is inversely proportional to the nutritional value of the formula. Where, Increase protein content of the product accompanied by a reduction in the cost. Generally, all costs of different formulae were inexpensive where the costs ranged from 4.80 to 5.80 LE per 1.00 kilogram of raw formula. **Mune et al., (2008**) cowpea have good potential as a source of low-cost protein, with nutritional quality comparable to those of other grain legume protein.

Conclusion

From the results of this study, it could be concluded that possibility preparation of vegan omelet-free from animal components and their derivatives- suitable with vegans and children who suffer from eggs allergy. These formulae have high nutritive value, easy to prepare, appropriate for people with low income and dependent on low-calorie diets**.**

Table (2): Proximate analysis of raw materials (g/100g dry weight basis).

Raw materials	Protein	Fat	Ash	Fiber	Total carbohydrates
Chickpea	23.69	3.81	3.39	3.84	65.27
Cowpea	25.79	2.31	3.73	5.49	62.68
Rice	8.34	0.68	0.79	0.56	89.63
Wheat flour 72%	10.75	2.30	0.40	2.99	83.56
Tomato	17.82	1.45	10.77	8.60	61.36
Carrot	6.10	1.74	5.98	11.30	74.88
Onion	11.53	1.68	5.13	7.15	74.51
Garlic	14.63	0.52	3.80	3.09	77.96
Coriander	19.13	5.41	10.02	10.81	54.63
parsley	21.43	2.60	12.29	10.44	53.24
Sagebrush	10.63	8.70	10.92	9.05	60.70
Green pepper	16.30	3.26	8.52	12.48	59.44

Table (3): Minerals content of raw materials (mg/100g dry weight basis).

Materials	Na	K	Ca	Mg	P	Fe	Zn	Cu
Chickpea	66.00	815.00	144.00	127.00	380.00	7.30	2.18	1.12
Cowpea	20.00	1213.00	104.00	136.00	347.00	6.80	2.10	0.46
Rice	13.00	126.00	24.00	32.00	110.00	0.92	1.30	0.09
Wheat flour 72%	4.00	110.00	19.00	32.00	90.00	1.10	1.30	0.13
Tomato	10.00	328.00	15.00	12.00	30.00	0.70	0.05	0.12
Carrot	63.00	345.00	42.00	18.00	42.00	1.60	0.42	0.06
Onion	13.00	139.00	35.00	12.00	56.00	0.90	0.11	0.23
Garlic	25.00	366.00	40.00	30.00	168.00	2.60	1.91	0.33
Coriander	54.00	366.00	134.00	9.00	64.00	3.50	3.30	0.63
Parsley	30.00	723.00	210.00	39.00	54.00	5.12	1.00	1.17
Sagebrush	11.00	360.00	145.00	125.00	60.00	27.85	4.55	1.14
Green pepper	53.00	195.00	15.00	14.00	25.00	0.90	0.04	0.17

Table (4): Sensory evaluation of different cooked vegan omelet formulae

Formulae no.	Color (10)	Taste (10)	Odor (10)	Texture (10)	General appearance (10)
1	9.00 ± 0.10^{a}	9.25 ± 0.10^{a}	9.00 ± 0.20^{ab}	8.50 ± 0.20^{ab}	9.00 ± 0.10^{ab}
2	8.50 ± 0.25^{b}	9.25 ± 0.05^{a}	9.00 ± 0.10^{ab}	8.75 ± 0.25^{a}	9.00 ± 0.15^{ab}
3	8.50 ± 0.20^{b}	9.25 ± 0.05^{a}	9.25 ± 0.10^{a}	8.75 ± 0.10^{a}	9.25 ± 0.10^{a}
4	8.25 ± 0.15^{bc}	9.00 ± 0.15^{ab}	9.00 ± 0.25^{ab}	8.50 ± 0.20^{ab}	9.00 ± 0.20^{ab}
5	8.00 ± 0.25^{c}	8.75 ± 0.10^{b}	9.00 ± 0.10^{ab}	8.50 ± 0.10^{ab}	8.75 ± 0.15^{bc}

* Each value in a column followed by the same subscript is not significantly different at ($p \leq 0.05$)
Formula no.1 contains 50% chickpea +0% cowpea +50% other ingredients.
Formula no. 2 contains 37.5% chickpea +12.5% cowpea + 50% other ingredients.
Formula no. 3 contains 25% chickpea +25% cowpea +50% other ingredients.
Formula no. 4 contains 12.5% chickpea +37.5% cowpea +50% other ingredients.
Formula no. 5 contains 0% chickpea + 50% cowpea +50% other ingredients

Table (5): Proximate chemical analysis and total energy of the cooked formulae (g/100g dry weight basis).

formulae No.	Crude protein	Crude fat	Total ash	Crude fiber	Total carbohydrates	Food energy (kcal/100g)
1	18.20	4.58	4.44	5.22	67.56	384.36
2	18.86	3.99	4.48	5.43	67.24	380.31
3	19.53	3.42	4.52	5.63	66.90	376.50
4	20.12	2.82	4.56	5.84	66.66	372.50
5	20.85	2.23	4.61	6.05	66.26	368.51

Table (6): Minerals content of the cooked formulae (mg/100g dry weight basis)

Formulae no.	Na	K	Ca	Mg	P	Fe	Zn	Cu
1	18.25	413.65	82.40	74.00	196.00	8.29	1.35	0.80
2	18.74	451.50	75.40	74.50	191.50	8.24	1.23	0.73
3	19.25	493.60	70.50	75.50	188.45	8.16	1.32	0.65
4	19.75	530.60	66.50	76.00	183.55	8.10	1.31	0.57
5	20.25	570.50	61.65	76.50	180.25	8.03	1.30	0.48

Formula no.1 contained 50% chickpea +0% cowpea +50% other ingredients.
Formula no. 2 contained 37.5% chickpea +12.5% cowpea + 50% other ingredients.
Formula no. 3 contained 25% chickpea +25% cowpea +50% other ingredients.
Formula no. 4 contained 12.5% chickpea +37.5% cowpea +50% other ingredients.
Formula no. 5 contained 0% chickpea + 50% cowpea +50% other ingredients
Formula no. 4 contained 12.5% chickpea +37.5% cowpea +50% other ingredients.
Formula no. 5 contained 0% chickpea + 50% cowpea +50% other ingredients

Table (7): Essential amino acids (g/Kg protein) contents of the more acceptable cooked formula (No.3) powder and its chemical scores in respect to FAO/WHO/UNU (1985) reference for children and adults.

Essential amino acids	Cooked formula No. (3)	FAO/WHO/UNU (1985)			
		Children		Adults	
		g/Kg protein	Chemical score	g/Kg protein	Chemical score
Histidine	25.92	19.00	136.42	15.00	172.80
Isoleucine	32.25	28.00	115.18	15.00	215.00
Leucine	58.70	66.00	88.94	21.00	279.52
Lysine	54.75	58.00	94.40	18.00	304.17
Therionine	31.60	34.00	92.94	11.00	287.27
Tryptophane	7.76	11.00	70.55	5.00	155.20
Valine	34.27	35.00	97.91	15.00	228.47
Methionine + Cysteine	18.75	25.00	75.00	20.00	93.75
Phenylalanine+ Tyrosine	59.25	63.00	94.05	21.00	282.14
Total essential amino acids	323.25	339.00	95.35	141.00	229.26

Formula no. 3 contained 25% chickpea +25% cowpea +50% other ingredients.

Table (8): Protein efficiency ratio (PER) and biological value (BV) of cooked formula (no. 3) proteins

	PER	BV
Formula (no. 3)	1.83	69.17
Caseine (reference)	2.50	76.23

Formula no. 3 contained 25% chickpea +25% cowpea +50% other ingredients.

Table (9): The proximate cost of raw materials used for producing suggested formulae.

Raw materials	Cooked formulae no.				
	1	2	3	4	5
Chickpea	500	375	250	125	-
Cost (LE)	4.00	3.00	2.00	1.00	-
Cowpea	-	125	250	375	500
Cost (LE)	-	0.75	1.50	2.25	3.00
Rice	100	100	100	100	100
Cost (LE)	0.30	0.30	0.30	0.30	0.30
Wheat flour 72%	85	85	85	85	85
Cost (LE)	0.25	0.25	0.25	0.25	0.25
Other ingredients Cost (LE)	1.25	1.25	1.25	1.25	1.25
Total cost (LE/1 kg)	5.80	5.55	5.30	5.05	4.80

Formula no.1 contains 50% chickpea +0% cowpea +50% other ingredients.
Formula no. 2 contains 37.5% chickpea +12.5% cowpea + 50% other ingredients.
Formula no. 3 contains 25% chickpea +25% cowpea +50% other ingredients.
Formula no. 4 contains 12.5% chickpea +37.5% cowpea +50% other ingredients.
Formula no. 5 contains 0% chickpea + 50% cowpea +50% other ingredients

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إعداد عجة نباتية من خلطات غير تقليدية

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الملخص العربى :

تهدف هذه الدراسة إلى إعداد عجة نباتية خالية من المنتجات الحيوانية ومشتقاتها تتناسب مع النباتيين والأطفال الذين يعانون من الحساسية ضد البيض ، حيث تم إعداد خلطات من الحمص واللوبيا كمصدر للبروتين بنسب استبدال متباينة ، بالاضافة الى مكونات غذائية أخرى لجميع الخلطات بنسب ثابتة. تم دراسة التركيب الكيميائي للمواد الخام والخلطات المطهية ، واجراء التقييم الحسي لها. أوضحت النتائج غني الحمص بالبروتين والصوديوم والكالسيوم والفوسفور بينما كانت اللوبيا الأعلى في محتواها من البروتين والبوتاسيوم والماغنيسيوم. كما تميزت المواد الخام بارتفاع محتواها من الكربوهيدرات وانخفاض محتواها من الدهون والطاقة الكلية. أشارت النتائج إلى إرتفاع محتوى الخلطات المطهية من البروتين والألياف والرماد بينما سجلت الكربوهيدرات الكلية والدهون والطاقة الكلية انخفاضا ملحوظا مع زيادة نسبة إضافة اللوبيا بالخلطات. دلت نتائج التقييم الحسي على أن جميع خلطات العجة النباتية المقترحة قد لاقت قبولا حسيا عاليا بنسب معنوية مختلفة. أظهرت النتائج امكانية انتاج عجة نباتية تتميز بقيمتها الغذائية العالية وسهولة تحضيرها ومناسبتها لذوي الدخل المنخفض والمعتمدين علي نظم غذائية منخفضة السعرات.

الكلمات المفتاحية: النباتيين ، عجة نباتية ، جودة البروتين، أحماض أمينية، التقييم الحسي.