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EVALUATION OF THE EFFECT OF DIFFERENT STORAGE METHODS OF FABA BEAN ON THE QUALITY OF COOKING (FALAFEL OR MEDAMES)

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ABSTRACT: The effect of different storage methods used in storing faba beans on the quality of processing changes that occur during cooking falafel or medames were investigated. Beans were stored in 5 different ways, storage: in plastic bags, in burlap bags, in plastic containers, in tin containers and storage after heating at 50°C for 10 min packed in plastic bags. The chemical composition of the beans was estimated before and after 9 months of storage period. The effect of storage methods on chemical composition and sensory properties of Feba bean medames and Egyptian falafel were studied. The results showed that, the highest percentage of moisture, protein and ash was in the samples stored by heat treatment, on the other hand, the highest percentage of fat and fiber was observed in the control samples. Falafel manufactured from faba beans stored in plastic containers showed the highest percentage of protein. While the Medames manufactured from faba beans stored after heating at 50°C for 10 min showed the highest percentage of protein. The falafel manufactured from faba beans stored in burlap bags showed the highest percentage of moisture.-The control sample of Medames showed the highest percentage of moisture. Falafel manufactured from faba beans stored in plastic bags showed the highest percentage of fat. While the Medames manufactured from faba beans stored after heating at 50°C for 10 min showed the highest percentage of fat. The control falafel showed the highest percentage of fiber, .Also, the control sample of Medames showed the highest percentage of fiber. Falafel manufactured from faba beans stored after heating at 50°C for 10 min showed the highest percentage of ash. The control Medames showed the highest percentage of ash. The highest acceptability for sensory properties was found in flafel stored in burlap bags and tin container. Similarly, the highest acceptability for sensory properties was found in Medames stored in burlap bags and tin container, There is no significant difference were noticed in overall acceptability.

Key words: Storage methods, chemical composition, falafel, Medames, sensory evaluation.

INTRODUCTION

Approximately 60% of the protein consumed by humans worldwide comes from plants, with a third of that coming from the Fabaceae family of crop legumes (**Smkal *et al.*, 2015; Henchion *et al.*, 2017**). As a long-term source of high-protein food, leguminous crops are one of the essential components of human nutrition and are farmed extensively over the world (**Collado *et al.*, 2019a; Sanju *et al.*, 2021**). They contain large amounts of polyunsaturated fatty acids, calcium, potassium, iron, zinc, and magnesium. Numerous studies have shown that eating a lot of beans can help the body fend off diseases like cancer, diabetes, osteoporosis, and cardiovascular disease.

The faba bean is an important crop in terms of ecology, nutrition, and economics (**Xiao *et al.*, 2021)**. The seeds are mostly grown for human use. Faba beans are high in protein, carbohydrates, crude fibre, vitamins, and minerals despite minor variations among cultivars (**Giménez *et al.*, 2013; Multari *et al.*, 2015; Collado *et al.*, 2019a; FAO, 2019; USDA, 2021**).

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Also they contain a lot of bioactive chemicals, such as flavonoids and phenolic compounds, which have anti-inflammatory, anti-diabetic, and antioxidant properties (**Siah *et al.*, 2014; Turco *et al.*, 2016; Valente *et al.*, 2018).**

Storage is the process of preserving the nutritional value of both the seedling and the food by keeping beans in storehouses, bags, piles, and bulks under specific conditions including ventilation, fumigation, and the ideal temperature and humidity (**Befikadu, 2014**). However, **Strauta and Muinece-Brasava (2016)** noted that legume seeds are frequently kept dry and at room temperature. Unfavourable storage conditions can reduce bean quality and increase cooking time, which results in lost colour, texture, and nutritional value. This led to poor quality beans which have a bad mouthfeel and texture, and processing degrades their nutritional value.

In the Middle East, particularly in Egypt, falafel is one of the staple fried vegetables (**Ismail and Kucukoner, 2017**). The ingredients for falafel, a classic dish from Egypt, include chickpeas, water, onion, garlic, spices, parsley, paprika, and sesame seeds (**Fikry *et al.*, 2021**). Due to its vegetarian-based ingredients, which include vitamins, dietary fibre, and bioactive components, falafel is regarded as a highly healthy food (**Ismail and Kucukoner, 2017**). Due to the high fat content brought on by the dipping in the oil, the traditional method for making fried falafel involves deep-frying, which is not favoured by those who value their health (**Fikry *et al.*, 2021).**

Egyptians consume faba beans in a variety of dishes, the most well-known of which being fullmedames, often known as ful. A fairly straight forward dish called ful medames is made with whole or mashed broad beans. Ful Medames is a very affordable food that is so well-liked that it might as well be regarded as the national dish of Egypt. It is sold by street sellers on their traditional carts or in restaurants (**Nathan, 2015: Pasqualone *et al.*, 2018**). Due to its high fibre content, ful medames is typically eaten for breakfast and can keep one full for the entire day. This dish is consumed during Ramadan before sunrise to make it easier for people to fast during the day (**Pasqualone *et al.*, 2020**).The aims of this study are evaluating the effect of different storage methods that are used in storing faba beans on the quality of food processing occur during cooking (Falafel or Medames).

MATERIALS AND METHODS

Materials

Faba beans (200 kg), Giza 40 variety, were obtained from Bahr El-Baqar, Al-Husseinia, Sharkia, Governorate, Egypt. After harvest on 10/4/2020.

Methods

Methods Used for Storage

Beans were stored in 5 different ways: storage: in plastic bags, in burlap bags, in plastic containers, in tin containers and storage by pre-heating at 50°C for 10 min backed in plastic bags and packing in blastic bags. The chemical composition of the beans was estimated before storage and after 9 months of storage under these conditions. Taking into consideration the following during the storage process: Cleanliness, cleaning the store well with fungal disinfectants, the store being well ventilated with “wire mesh”, placing a fumigation tablet in the store with the crop to avoid being affected by mites, choosing clean sacks for storage and disinfecting them well before the packing process, examining the seeds once a month to avoid Infested with mites, an empty room of 3×3 meters, temperature 18 °C, humidity 15% during storage period (9 months).

Preparing and Cooking Egyptian Falafel

Cooking Egyptian Falafel was manufactured according to **Ismail and Kucukoner (2017),** as follows: faba beans were dry cleaning, mechanically decorticated beans (with a PRL 'Mini dehuller'), soaking in water (1:3 w/v) for 16 hours at room temperature, draining, mincing twice, addition of salt and spices, fermentation at room temperature for 30 min, forming into balls (~ 15 gm each),and then deep frying in cotton seed oil at 175 C° for 6 min. Cooked Falafels were dried at 50 C° for 18 hours in an electric air draught oven. The dried Falafels were ground to pass through a 70 mesh sieve, packed into air-tight jars and kept at 4 C° until further manipulation.

Six treatments of falafel were made, as follows:

- Control Falafel
- Falafel made from beans stored in plastic bags for 9 months.
- Falafel made from beans stored in burlap sacks for 9 months.
- Falafel made from beans stored in plastic containers for 9 months.
- Falafel made from beans stored in tin containers for 9 months.
- Falafel made from beans pre- heated backed in plastic bags for 9 months.

Preparing of Medames

Broad beans are referred to as ful in Egyptian Arabic, while medames, which means "buried," refers to the ancient cooking technique, which included burying a pot with water and beans under hot coals to cook for an extended period of time. The dried broad beans used to make ful medames must be softened by soaking them in water before cooking. The beans are then emptied, fresh water is added, and the stove is steadily heated for 6 or 7 hours, or until the beans are tender (**Nathan, 2015**).

6 treatments of medames were made, and they were as follows:

- Control medames.
- Medames made from beans stored in plastic bags for 9 months.
- Medames made from beans stored in burlap sacks for 9 months.
- Medames made from beans stored in plastic containers for 9 months.
- Medames made from beans stored in tin containers for 9 months.
- Medames made from beans pre- heated backed in plastic bags for 9 months.

Analytical Methods

Moisture, total nitrogen, fats as ethyl ether extract, ash, and crude fiber contents were determined according to the **AOAC (2007**). Carbohydrates were calculated by difference.

Sensory Analysis of Fried Falafel and Medames

A sensory evaluation by 30 well trined panellists was conducted to evaluate the air-fried falafel samples according to **ISO , (2012**). Consumers with some training made up the panel. They consisted of people who are typically familiar with the calibre of falafel because they often eat it in Egypt. Sensory characteristics (appearance, aroma, taste, crispiness, and overall preference). According to **Fikry *et al.* (2016)** and **Manzoor *et al.* (2019),** the sensory evaluation process was carried out in a room with a regulated atmosphere (25±2°C) and white fluorescent lighting. A nine-point hedonic scale (1 being strongly disliked, 5 being neither liked nor disliked, and 9 being extremely liked) **Mendes *et al.* (2001).**

Statistical Analysis

The Statistical Package for Social Sciences (SPSS), version 21.0 (SPSS Incorporated Chicago, IL), was used to do an Analysis of Variance (ANOVA) on the data. Using Duncan's multiple range test (DMRT), means were separated, and significant differences were identified at $p \leq 0.05$.

RESULTS AND DISCUSSION

Influence of Storage Conditions on Chemical Composition of Faba beans

Table 1 shows the effect of different storage conditions for a period of 9 months on the chemical composition of faba beans, and through the results it is noted that the moisture, protein, fat, ash and fiber contents of the bean samples compared and stored for 9 months were 13.6, 26.0, 1.53, 7.6 and 25%, respectively. While the moisture, protein, fat, ash and fiber contents of bean samples stored in plastic bags for 9 months were 13.23, 24.73, 0.50, 7.29 and 11.18%, respectively. The moisture, protein, fat, ash and fiber contents of bean samples stored in burlap sacks for 9 months were 12.86, 30.26, 0.94, 6.16 and 9.28%, respectively. The moisture,

Table 1. Influence of storage conditions on chemical Composition of faba beans

Items	Storage methods					Control
	Thermal heating	Plastic bags	Plastic container	Tin container	Burlap bags	
Moisture	14.23a±0.75	13.23c±0.28	12.95d±0.26	11.85f±0.33	12.68e±0.30	13.6b±0.24
Protein	30.9a±1.12	24.73±d0.66	25.74c±0.80	26.84b±0.74	30.26a±0.9	26±b0.78
Fat	0.63e±0.12	0.5f±0.05	0.84c±0.02	0.79d±0.06	0.94b±0.08	1.53a±0.05
CHO	44.74±1.12	54.75±1.34a	51.34±1.12d	54.19±1.25a	50.9±1.46c	51.27±1.33b
Ash	9.5±0.45	7.29d±0.12	9.13b±0.24	6.33e±0.15	6.16f±0.22	7.6c±0.18
Fiber (g100g -1)	10.91c±0.80	11.18b±0.86	6.84f±0.78	8.31e±0.90	9.28d±0.98	25a±0.94

Values are means ± standard deviation of triplicate determinations. Mean values with different superscript in each column are significantly different ($p < 0.05$) from one another

protein, fat, ash and fiber contents of bean samples stored in plastic containers for 9 months were 12.95, 25.74, 0.84, 9.13 and 6.84%, respectively. The moisture, protein, fat, ash and fiber contents of bean samples stored in tin containers for 9 months were 11.85, 26.84, 0.79, 6.33 and 8.31%, respectively. While the moisture, protein, fat, ash and fiber contents of bean samples stored after pre-heating at 50°C for 10 min backed in plastic bags for 9 months were 13.23, 24.73, 0.50, 7.29 and 11.18%, respectively. It was noted that the highest percentage of moisture, protein and ash was in the samples stored by pre-heating at 50°C for 10 min backed in plastic bags, and the highest percentage of fat and fiber was observed in the control samples.

Generally ,there was a highly significant difference is moisture content between the control sample and different storage process .The high moisture content were noticed in thermal heating process and the lowst value (11.85%) was noticed in tin container. There was no significant difference in protein content were noticed in thermal heating and burlap bags storage process. While the other storage methods were significantly difference fat content was high level is control (1.53%) compared to the other storage process there was a highly significant differences in ash and is fibe content between the control and the all storage process, they were 9.5% and 25%, respectively.

These results were inline with finding of **Helmy *et al.* (2020) and Nasser abbas *et al.* (2008).**

Influence of Storage Conditions on Chemical Composition of Feba bean Medames and Egyptian Falafel

Generally, there was a highly significant difference between the chemical composition in felafel and medames with the storage methods during the storage time

Table 2 shows the effect of the different storage methods used in this study on the chemical composition of the resulting falafel and medames.

Results showed that % of protein in the falafel treatments ranged between 18 to 22.94, and the treatment manufactured from faba beans stored in plastic containers showed the highest percentage of protein 22.94%, while the lowest percentage of protein was observed in the control treatment 18%. The percentage of protein in the medames treatments ranged between 20.0 to 24.97%, the high level was noticed in faba beans stored by pre-heating at 50°C for 10 min backed in plastic bags while the lowest protein value was observed in the control treatment. Our results were in line with those reported by **Abeer *et al.* (2013) and Helmy *et al.* (2020)**.

The percentage of moisture content in the falafel treatments ranged between 6.66 to 12.82%, and the treatment manufactured from faba beans stored in burlap bags showed the highest percentage of moisture 12.82%, while the lowest value was observed in the treatment manufactured from faba beans stored in plastic container 6.66%. While, the percentage of moisture in the medames treatments ranged between 1.62 to 3.53 %, and

Table 2. The effect of storage methods on chemical composition of Feba bean Medames and Egyptian falafel

Items		Storage methods					Control
		pre-heating backed in plastic bags	Plastic bags	Plastic container	Tin container	Burlap bags	
Moisture	Egyption Falafel	10.47c±0.55	8.36e±0.62	6.66f±0.48	11.85b±0.51	12.82a±0.55	9.5d±0.66
	Medames	3.53a±0.15	1.62d±0.11	3.42a±0.18	2.72b±0.12	1.73c±0.15	3.2±0.22
Protein	Egyption Falafel	20.22b±0.35	19.55c±0.42	22.94a±0.28	19.91c±0.45	20.46b±0.36	18d±0.35
	Medames	24.97±a0.40	22.57c±0.33	25.43a±0.51	23.57b±0.45	23.83b±0.33	20d±0.76
Fat	Egyption Falafel	15.79c±0.85	16.94b±0.66	12.48e±0.83	20.29a±0.92	12.31e±0.75	14.5d±0.28
	Medames	11.74a±0.25	9.91c±0.33	10.53b±0.42	9.88c±0.30	6.32d±0.45	11.40a±0.44
CHO	Egyption Falafel	49.31±1.24	51.69±1.51b	54.74±1.62	43.122e	50.28±1.23c	54.5±1.42a
	Medames	50.06±1.12e	59.95±1.32b	52.29±1.25d	57±1.34c	61.92±1.21a	57.4±1.25c
Ash	Egyption Falafel	4.21a±0.14	3.46c±0.18	3.18d±0.12	4.04b±0.13	4.13ab±0.16	3.5c±0.18
	Medames	9.7a±0.22	5.95e±0.30	8.33b±0.42	6.83c±0.35	6.2d±0.45	8b±0.50
Fiber (g 100g-1)	Egyption Falafel	43.61d±1.3	42.86e±1. 5	49.64b±1.1	46.89c±1.2	47.06c±1.4	55.0a±0.03
	Medames	81.81c±0.25	79.11d±0.32	82.62b±0.45	81.93c±0.35	81.53c±0.30	88.0a±0.26

Values are means ± standard deviation of triplicate determinations. Mean values with different superscript in each column are significantly different ($p < 0.05$) from one another.

the control treatment showed the highest value 3.53%, while the lowest value was observed in the treatment manufactured from faba beans stored in plastic bags 1.62%.

This results offarmintioned with those obtained by **Ahmed *et al.* (1988) and Helmy *et al.* (2020).**

The fat in the falafel treatments ranged between 12.31 to 16.94%, and the treatment manufactured from faba beans stored in plastic bags showed the highest percentage of fat, while the lowest percentage of fat was observed in the treatment manufactured from faba beans stored in burlap bags. While the percentage of fat in the medames treatments ranged between 6.32 to 11.74 %, and the treatment manufactured from faba beans stored by pre-heating at 50°C for 10 min backed in plastic bags showed the highest percentage of fat, while the lowest valu of fat was observed in the treatment manufactured from faba beans stored in burlap bags.

The fat content of faba beans increases with storage length, regardless of the storage circumstances (**Helmy *et al.*, 2020**). This could be connected to metabolic processes taking place in seed mass.

The percentage of fiber in the falafel treatments ranged between 42.86 to 55.0%, and the control treatment showed the highest percentage of fiber, while the lowest percentage of fiber was observed in the treatment manufactured from faba beans stored in Plastic bags. While the fiber % in the medames treatments ranged between 79.11 to 88.0%, and the control treatment showed the highest percentage of fiber, while the lowest percentage of fiber was observed in the treatment manufactured from faba beans stored in Plastic bags.

The length of time that faba beans have been stored has an adverse effect on how much crude fibre they contain. According to **Helmy *et al.* (2020),** the crude fibre content of faba beans appears to decrease with increased storage periods.

The ash content in the falafel treatments ranged between 3.18 to 4.21%, and the treatment manufactured from faba beans stored by pre-heating at 50°C for 10 min backed in

plastic bags showed the highest ash, while the lowest percentage of ash was observed in the treatment manufactured from faba beans stored in Plastic container. While the percentage of ash in the medames treatments ranged between 5.95 to 8.0%, and the control treatment showed the highest percentage of ash, while the lowest value of ash was observed in the treatment manufactured from faba beans stored in Plastic bags. Our results are contraste with findings of **Stefanello *et al.* (2015).**

The Effect of Feba Bean Storage Methods on Sensory Measurements of Egyptian Falafel

Table 3 shows the effect of the different storage methods used in this study on the sensory measurements of the resulting falafel. It is noted through the results that the maximum value of ranks mean for textures and odor were found under used storage methods (storage at Plastic container and Plastic bags). While the maximum value of ranks mean for odor were found under used storage methods (storage at Plastic bags and Burlap bags).But, the maximum value of ranks mean for taste was found under used storage methods (storage at Plastic bags and thermal heating). On the other side, the maximum value of ranks mean for color was found under used storage methods (storage at Tin container and Plastic bags). At the end, the maximum value of ranks mean for public acceptance was found under used storage methods (storage burlap bags and tin container). **Nasar-Abbas *et al.* (2009)** who found that Feba bean storage methods more affect on the sensory measurements of Egyptian falafel.

Generally, data presented in table (3) showed that there was no significant difference between tin containers, burlap, bags storage was good condition for all sensory items.

The Effect of Feba bean Storage Methods on Sensory Measurements of Medames

The statistical analysis showed that: the maximum value of ranks mean for textures were found under used storage methods (storage at Plastic bags and Burlap bags). While the maximum value of ranks mean for odor were found under used storage methods (storage at thermal heating and Burlap bags).But, the maximum value of ranks mean for taste was found under used storage methods (storage at Tin container and thermal heating). On the other side, the maximum value of ranks mean for color was found under used storage methods (storage at Tin container and burlap bags). At the end, the maximum value of ranks mean for public acceptance was found under used storage methods (storage burlap bags and tin container) these data were shown in Table 4. **Siah *et al.* (2014)** who found that Feba bean storage methods more effect on the sensory measurements of Egyptian medames.

All the storage method except plastic containers had no significant difference in public acceptance "over all acceptability" on sensory evaluation of medames**.**

Table 3. Effect of Feba bean storage methods on Sensory measurements of Egyptian falafel

Sensory measurements	Control	Storage methods				
		pre-heating backed in plastic bags	Plastic bags	Plastic container	Tin container	Burlap bags
Textures	7.68b ± 0.16	7.1 c ± 0.18	8.0 a ± 0.3	7.9 ab ± 0.38	7.7 b ± 0.45	7.7 b ± 0.4
Odor	7.96 bc± 0.15	7.5 c ± 0.31	8.3 a ± 0.3	8 b ± 0.42	8 b ± 0.3	8 b ± 0.37
Taste	7.9 b± 0.19	8.2 a ± 0.29	8.1 ab ± 0.41	7.5 c ± 0.48	8 ab ± 0.47	7.7 bc ± 0.45
Color	7.56b ± 0.22	6.5 c ± 0.37	8.1 a ± 0.5	7.3 b± 0.4	8 ab ± 0.49	7.9 ab ± 0.53
Public acceptance	7.8 b± 0.16	7.3 c ± 0.3	7.9 ab ± 0.38	7.8 b ± 0.33	8.1 a ± 0.43	7.9 ab ± 0.41

Values are means ± standard deviation of triplicate determinations. Mean values with different superscript in each column are significantly different ($p < 0.05$) from one another

Table 4. Effect of Feba bean storage methods on sensory measurements of Feba bean Medames

Sensory measurements	Control	Storage methods				
		pre-heating backed in plastic bags	Plastic bags	Plastic container	Tin container	Burlap bags
Textures	8.14b ± 0.15	8.0 b ± 0.33	8.6 a ± 0.37	7.7 c ± 0.26	8.1 b ± 0.23	8.3 ab ± 0.45
Odor	8.22b ± 0.17	8.8 a ± 0.25	8.2 b ± 0.51	7.9 c ± 0.38	8.0 b ± 0.45	8.2 b ± 0.33
Taste	7.88ab ± 0.16	8.1 a ± 0.28	7.7 b ± 0.47	7.5 b ± 0.34	8.2 a ± 0.36	7.9 ab± 0.38
Color	7.82b ± 0.17	7.7 b ± 0.52	7.7 b ± 0.4	7.4 c ± 0.22	8.0 ab ± 0.37	8.a A ± 0.33
Public acceptance	8.14a ± 0.16	8.2 a ± 0.2	8.2 a ± 0.44	7.8 b ± 0.36	8.2 a ± 0.42	8.3 a ± 0.4

Values are means ± standard deviation of triplicate determinations. Mean values with different superscript in each column are significantly different ($p < 0.05$) from one another.

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تقييـــم تأثير طـرق تخــزيــن الفـــول البلـــدي المختلفــة علــى جـوده طبـخ الفـلافـل والمـدمـس

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تم دراسة تأثير طرق التخزين المختلفة المستخدمة في تخزين الفول على جودة التغيرات الغذائية التي تحدث أثناء طهي الفلافل أو المدمس. تم تخزين الحبوب بخمسة طرق مختلفة: التخزين في أكياس بلاستيكية، التخزين في أكياس من الخيش، التخزين في حاويات بلاستيكية، التخزين في حاويات من الصفيح والتخزين عن طريق المعاملة الحرارية المبدئية عند 50 درجة مئوية لمدة 10 دقائق والمعبأة في أكياس بلاستيكية . تم تقدير التركيب الكيميائي للحبوب قبل التخزين وبعد 9 أشهر من التخزين في ظل هذه الظروف. كما تم دراسة تأثير طرق التخزين على التركيب الكيميائي والقياسات الحسية للفول المدمس والفلافل المصرية. أظهرت النتائج أن أعلى نسبة رطوبة وبروتين ورماد في عينات الفول كانت في العينات المخزنة بالمعاملة الحرارية المبدئية عند 50 درجة مئوية لمدة 10 دقائق والمعبأة في أكياس بلاستيكية ، ولوحظت أعلى نسبة من الدهون والألياف كانت في عينات المقارنة. كم أظهرت معاملة الفلافل المصنعة من الفول المخزن في عبوات بلاستيكية أعلى نسبة بروتين. بينما أظهرت معاملة المدمس المصنعة من الفول المحفوظ بالمعاملة الحرارية المبدئية عند 50 درجة مئوية لمدة 10 دقائق والمعبأة في أكياس بلاستيكية أعلى نسبة بروتين . وأظهرت معاملة الفلافل المصنعة من الفول المحفوظ في أكياس من الخيش أعلى نسبة رطوبة، بينما أظهرت عينات مدمس المقارنة أعلى نسبة رطوبة. كما أظهرت معاملة الفلافل المصنعة من الفول المحفوظ في أكياس بلاستيكية أعلى نسبة دهون ، بينما أظهرت معاملة المدمس المصنعة من الفول المخزن بالمعاملة الحرارية المبدئية عند 50 درجة مئوية لمدة 10 دقائق والمعبأة في أكياس بلاستيكية أعلى نسبة دهون. وأظهرت معاملة فلافل المقارنة أعلى نسبة من الألياف، كما أظهرت معاملة مدمس المقارنة أعلى نسبة من الألياف. أظهرت معاملة الفلافل المصنعة من الفول المحفوظ بالمعاملة الحرارية المبدئية عند 50 درجة مئوية لمدة 10 دقائق والمعبأة في أكياس بلاستيكية أعلى نسبة رماد. بينما أظهرت معاملة مدمس المقارنة أعلى نسبة رماد. كما وجد أن أفضل درجة للقبول العام في الفلافل كان من الفول المخزن بطرق التخزين الأتية (الأكياس و الخيش وحاويات الصفيح) بينما وجد أفضل درجة للقبول العام في المدمس المصنع من الفول المخزن بطرق التخزين الأتية (الأكياس و الخيش وحاويات الصفيح) ولا توجد اختلافات معنوية ملحوظة بين الطرق المختلفة في القبول العام.

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