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EFFECT OF A HERBS MIXTURE POWDER AND ITS OILS ON THE QUALITY OF BEEF BURGERS

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ABSTRACT: *The effect of a herbs mixture powder (black seed, mint, rosemary, marjoram and chamomile) and its oils using zero,0.4,0.8,1.2 and 1.6 g/L on beef burgers quality was studied. Chemical composition of fresh and cooked beef burgers was determined. The Effect of frozen storage at – 18 °C for 6 months on chemical composition, physical properties and antibacterial activity of herbs mixture as powder and its oils in beef burgers was also determined. Organoleptic properties of beef burgers during frozen storage at-18°C for 6 months was also evaluated. The results showed that control fresh beef burgers (without herbs mixture) recorded the highest moisture, protein and ash content (%),while beef burgers with the herbs mixture powder recorded the highest carbohydrates and energy value. On the other hand, beef burgers with herbs mixture oils recorded the highest fat content%. With progress of storage period (6 months), the moisture and protein decreased, while the fat, ash, fiber, carbohydrates and energy value increased. The beef burgers with herbs mixtures oils recorded the lowest T.B.A. value than that of beef burgers with herbs mixture powder. Microbiological aspects indicated that the beef burgers with herbs mixture oils had higher inhibitory effect for all tested microorganisms than that of beef burgers with herbs mixture powder during storage period for 6 months at – 18 °C. Finally, it could be concluded that beef burgers with herbs mixture oils was slightly better than that of beef burgers with herbs mixture powder considering the Organoleptic properties.*

Key words: *Herbs powder, Herbs oil, Beet burgers.*

INTRODUCTION

Herbs are mainly added as flavorings and coloring agents. However, they are also a source of many other substances, such as sugars, nitrates, and metallic ions. A variety of herbs added to meat have been found to accelerate lactic acid production by the lactic acid bacteria. Furthermore, some spices and herbs (garlic, nutmeg, mace, paprika, rosemary, and sage) contain powerful antioxidants that can extend the shelf life of beef burgers. Indeed, the oxidation of lipids in foodstuffs results in the development of off flavors, resulting in a product that is unacceptable for human consumption (Aguirrezábal *et al.*, 2000).

In most cases, the levels of spices and herbs used in the production of beef burgers are insufficient for their antimicrobial activity to interfere with

the growth of food-borne pathogens, and hence they are not very effective as preservatives. This is in contrast with other meat properties, where a mixture of herbs can be successfully applied to stabilize the sensory appearance and hence extend the shelf life of the food (Grohs and Kunz 2000).

Besides their antioxidant activity, many spices, however, display antimicrobial activities. The antiseptic potential of spices and herbs resides in the essential oils. Extensive studies have been performed to determine its inhibitory properties, and many food-borne pathogens, both gram-positive and gram-negative bacteria, have been shown to be inhibited by spices (Leuschner and Zamparini, 2002). For spices such as nutmeg, black pepper and cinamon it is interesting that the pathogenic *Escherichia coli* O157:H7 strain is more susceptible than non pathogenic *E. coli* (Takikawa *et al.*, 2002).

Beef burgers is a food that is prepared from comminuted and seasoned meat and is usually formed into a symmetrical shape. (Kramlich, 1974)The bacteriological load of meat products depends upon the microbial load of the raw meat used befor grinding, sanitary conditions, and time and temperature of storage. Other sources of microorganisms in beef burgers include herbs, condiments, salt and natural casings. The latter have been found to contain high numbers of bacteria (Hefnawy and Youssef, 1985).

MATERIALS AND METHODS

1. Materials

1.1. Source of herbs:

Commercially ground dried herbs and their oils such as {Black seed} (*Nigella sativa*), mint (*Menthea piperita*), Rosemary (roosmary) Chamomile, (Chamomilla) and Marjoram (*majorana hortensis*) were obtained from local market, Minufiya Governorate. Using zero,0.4,0.8,1.2 and 1.6 g/L.

1.2.Microbiological cultures:

Bacterial, fungal and yeasts cultures used in this study involved: *Escherichia coli* (DSM 30083), *Staphylococcus aureus* (DSM 1104), *Bacillus cereus* (DSM 315), *Salmonela sp.* (DSM 347) were obtained from Microbiological Resource Center "MIRCIN",Faculty of Agriculture, Ain Shams University, Cairo, Egypt. and Mold (*Aspergillus niger*) & yeast, (*Candida albicans*) were obtained from Department of Microbiology, Faculty of Science, Ain Shams University, Cairo, Egypt.

3.1.3. Source of meat:

Meat (beef of the carcase for equarter) were obtained from the local market, Minufiya Governorate.

2. Methods:

2.1. Microbiological methods:

2.1.1. Cultivation and enumeration media:

The medium used for molds and yeast was potato dextrose agar according to the method described by (ICMSF, 1996). Coliform group was determined accordind to (WHO,1988),while *Staphylococcus aureus* detemined by using Baird-Parker agar with egg yolk tellurite emulsion as supplement (ICMSF, 1996).*Bacillus cereus* determined by using *Bacillus cereus* selective agar medium with supplement SR99 according to the method described by (Roberts, 1991). The medium used for *Salmonella sp.* was SS agar modified Oxoid (Bryan, 1991).

2.1.2. Preparation of beef burgers:

Beef burgers were prepared using the following formula:Lean meat (beef) 66.0 %, fat tissues 19.50 %, salt (sodium chloride) 2.00 %, water (as ice) 10.00%, herbs mixture 0.80%, and starch 1.70 %. Mixture of herbs powder black seed, mint, rosemary, marjoram and chamomile (prepared at equal amounts 1:1:1:1:1) was added to the beef burgers and replaced by herb oil at the same ratio in beef burgers samples. Beef burgers was stored at -18 °C for 6 months.

3. Analytical Methods:

Moisture, protein (N x 6.25 kjeldahl method), fat (hexane solvent, Soxhiet apparatus), fiber and ash were determined according to the method recommended by A. 0. A. C. (2000).

Carbohydrate was calculated by differences as follows: % Carbohydrates= 100 - (% moisture + % protein + % fat + % ash + % fiber).

Energy value was estimated by multiplying protein and carbohydrates by 4.0 and fat by 9.0.

Thiobarbituric acid value was determined as described by Pearson (1970).

4. Physical Proparties Methods:

Water holding capacity of beef burgers samples was determined according to the method described by Grau and Hamm (1953) and Soloviev (1966).

Cooking loss of beef burgers calculated as percent of original weight as follows:

$$\text{Cooking loss(\%)} = \frac{\text{Fresh sample weight} - \text{fried sample weight}}{\text{Fresh sample weight}} \times 100$$

5. Organoleptic evaluation of beef burgers:

After cooking beef burgers were subjected to organoleptic tests (by ten judges) according to Watts *et al.*, (1989). Judging scale for colour, aroma, taste, texture and overall acceptability was as follows: Very good 8-9, good 6-7, fair 4-5, Poor 2-3 and very poor 0-1.

RESULTS AND DISCUSSION

1.Chemical composition of different types of fresh beef burgers:

Data presented in table (1) show the chemical composition of fresh beef burgers as influenced by addition of herbs mixture and its oils (on wet weight basis).

It is clear to notice that control beef burgers (without herb mixtures) recorded the highest moisture, protein and ash content (%) on wet weight basis. The values were 58.20%, 16.28% and 2.20%, respectively. While beef burgers with herbs mixture powder recorded the highest fiber content. The values was 4.88%. Similar results recorded by Chandraskehar *et al.*, (1995).

On the other hand, beef burgers with herb mixtures as oils recorded the highest fat, carbohydrates content% and energy value, the values were 15.55%, 7.56% and 231 kcal/ 100g, while it recorded the lowest values for moisture, protein, ash and fiber content on wet weight basis. The values were 55.07%, 15.44%, 2.05% and 4.33%, respectively. These results are in agreement with the finding of George and William (1994).

2. Chemical composition of beef burgers as influenced by addition herbs mixture and its oils during frozen storage at-18°C for 6 months:

The chemical composition of fresh beef burgers as influenced by addition of herbs mixture and its oils during frozen storage at -18 °C for 6 months (on wet weight basis) are shown in table (2).

It clearly evident that the highest moisture, protein and ash content % (on wet weight basis) were recoded for control beef burgers. The values were 52.80%, 13.25% and 3.91%, respectively. While the highest values of carbohydrates was recorded in this beef burgers with herb mixtures as powder. The values was 7.49 %. Similar results recorded with Gerhardt (1968) and Harget *et al.*, (1980).

On the other hand, the highest fat (on wet weight basis) were recorded with beef burgers with herbs mixture oils. The values were 21.15%, respectively. While the lowest values recorded for control beef burgers; values were 20.02% and 255.06 kcal/100 g, respectively. These results are in agreement with that of (Osama, 2001).

Finally, data obtained from tables (1-2) indicated that with progress of storage period (6 months), the moisture and protein decreased. While the fat, ash, fiber, carbohydrates and energy value increased.

Table (1): Chemical composition of fresh beef burgers as influenced by addtion of herbs mixture and its oil.

Constituents	Moisture %	Protein %	Fat %	Ash %	Fiber %	Carbohydrates %	Energy Value
Beef burger (Control)	58.20	16.28	14.80	2.20	4.55	3.97	214.20
Beef burger + Herbs (Mixture powder)	56.76	15.84	15.25	2.08	4.88	5.19	221.37
Beef burger + Herbs (Mixture oils)	55.07	15.44	15.55	2.05	4.33	7.56	231.95

Table (2): Chemical composition of beef burgers as influenced by addtion of herbs mixtures and its oils after frozen storage at -18 °C for 6 months.

Constituents	Moisture %	Protein %	Fat %	Ash %	Fiber %	Carbohydrates %	Energy Value
Beef burger (Control)	52.80	13.25	20.02	3.91	4.55	5.47	255.06
Beef burger + Herbs (Mixture powder)	50.33	13.01	21.12	3.04	5.01	7.49	272.08
Beef burger + Herbs (Mixture oils)	51.38	13.15	21.15	3.59	4.50	6.23	267.87

The changes in thiobarbituric acid value (T.B.A.) of beef burgers as influenced by addition of herbs mixture and its oils during storage period at – 18 °C for 6 months are shown in table (3).

It is clear to notice that at zero time of storage period at– 18 °C the values of T.B.A. were 0.50, 0.36 and 0.23 mg / kg for control beef burgers, beef burgers with herb mixture as powder and beef burgers with herb mixture as oils, respectively.

At the end of frozen storage (6 months) at– 18 °C the T.B.A. recorded the highest values with all tested beef burgers samples by different rates. The values were 1.72,1.58 and 1.38 mg / kg for control beef burgers, beef burgers with herb mixture as powder and beef burgers with herb mixture as oils, respectively.

Finally, it could be concluded that the beef burgers with herb mixture as oils recorded the lowest T.B.A. value than that of beef burgers with herb mixtures as powder due to higher antioxidation activity of herbs mixture oils during frozen storage period. The obtained data were in agreement with the findings of (Farag *et al.*,1990 and Osama, 2001).

3. Physical properties of beef burgers as influenced by addition of herbs mixture and its oils during frozen storage at -18 °C for 6 months.

Data presented in table (4) show the physical properties of beef burgers as influenced by addition of herbs mixture powder and its oils during frozen storage at -18 °C for 6 months.

The obtained results indicated that the values of water holding capacity (W.H.C.) at zero time of storage period were 3.74 and 3.78 cm^2 for beef burgers with herbs mixture powder and oils, respectively.

With advancement of storage period the W.H.C.value increased indicating deterioration of WHC due to increase of free water. The value were 3.22 and 3.31 cm^2 after 3 months of frozen storage, while the highest decrease of W.H.C. value recorded at the end of storage period reached 2.20 and 2.06 cm^2 for beef burgers with herbs mixture as powder and oils, respectively.

In case of plasticity, a markedly decrease was observed during storage of beef burgers with herbs mixture as powder and its oils; maximum decrease recorded at the end of storage period. The plasticity decreased from (4.78 to 3.05 cm^2 /0.3g meat) and from (4.74 to 2.98 cm^2 /0.3g meat) after 6 months of frozen storage period. These results are in agreement with the report of (El-Kholie, 1994 and Osama, 2001), being ascribed to possible dryness during storage, besides protein denaturation which reduce the tenderness during frozen storage.

On the other hand, the values of cooking loss and yeild of beef burgers with herbs mixture as powder and its oils were (30.46 % & 69.54 %) and (30.95 % & 69.05 %), respectively at zero time storage.

Table (3): Changes in thiobarbituric acid value (T.B.A) of beef burgers as influenced by addition of herbs mixture and its oils during frozen storage at -18 °C for 6 months (mg /Kg).

Beef burger blends / Storage Period (month)	Beef burger (control)	Beef burger + Herbs mixture powder	Beef burger + Herbs mixture oils
Zero time (0)	0.50	0.36	0.23
1	0.70	0.60	0.50
2	0.87	0.71	0.59
3	1.03	0.98	1.18
4	1.43	1.32	1.23
5	1.58	1.48	1.33
6	1.72	1.58	1.38

Table (4): Physical properteis of beef burgers as influenced by addtion of herbs mixture (0.8%) powder and its oils during frozen storage at -18 °C for 6 months.

Items / Storage Period (month)	Water holding capacity (WHC)		Plasticity		Cooking loss		Yeild	
	Powder	Oils	Powder	Oils	Powder	Oils	Powder	Oils
Zero time (0)	3.74	3.78	4.78	4.74	30.46	30.95	69.54	69.05
1	3.56	3.61	4.33	4.28	33.67	34.14	66.33	65.86
2	3.51	3.57	4.21	4.16	35.15	35.60	64.85	64.40
3	3.22	3.31	3.75	3.71	38.81	39.21	61.19	60.79
4	2.97	3.05	3.42	3.35	42.14	42.55	57.86	57.45
5	2.74	2.79	3.27	3.24	43.26	43.82	56.74	56.18
6	2.20	2.06	3.05	2.98	44.85	45.37	55.15	54.63

With progress of storage period for 3 months a marked increase in cooking loss and decrease in yeild was observed. The values were (38.81% & 61.19 %) and (39.21 % and 60.79 %) for herbs powder and oils beef burgers, respectively.

The highest incease in cooking loss and decrease in yeild was recorded at the end of storage period (6 months). The values were (44.85 % & 55.15 %) and (45.37 % & 54.63 %) for beef burgers prepared with herbs mixture as powder and oils, respectively. Similar results were obtained by (Osama, 2001 and Sameha, Alloush, 2002).

4.Microbiological aspectes of fresh beef burgers as influenced by addition of herbs mixture and its oils during frozen storage at -18 °C for 6 months.

Data given in table (5) show the effect of herbs mixture powder on some microorganisms in fresh beef burgers during storage period at– 18 °C for 6 months.

It is evident that at zero time of frozen storage the counts of all tested microorganisms (*E. coli, Salmonella sp., Bacillus cereus, Staphylococcus aureus, Aspergillus niger* and *Candida albicans*) were 1.0×10^6 cfu / g.

With advancement of storage period (3 months) at– 18 °C the counts of all tested microorganisms in beef burgers samples greatly decreased. The counts were 8.5×10^4, 1.0×10^5, 8.6×10^3, 7.3×10^4, 5.5×10^4 and 6.7×10^4 cfu / g for *E. coli, Salmonella sp., Bacillus cereus, Staphylococcus aureus, Aspergillus niger* and *Candida albicans*, respectively; percent decrease ranged 88.0 – 99.16%.

While, at the end of storage period for 6 months at – 18 °C the counts of all tested microorganisms in beef burgers samples recorded the highest inhibition by more different rates (percent decrease ranged 99.0 99.9%). The counts were 1.4×10^3, 1.3×10^4, 1.2×10^3, 1.5×10^3, 2.8×10^3 and 1.7×10^3 cfu / g for *E. coli, Salmonella sp., Bacillus cereus, Staphylococcus aureus, Aspergillus niger* and *Candida albicans*, respectively. Similar results reported with the obtained data with those of (Bracco *et al.*, 1981 and Agaoglu *et al.*, 2007).

The effect of herbs mixture oils on some pathogenic microorganisms in fresh beef burgers during storage period at– 18 °C for 6 months is shown in table (5).

The obatined data indicated that at zero time of frozen storage the counts of all tested microorganisms (*E.coli, Salmonella sp.,Bacillus cereus, Staphylococcus aureus, Aspergillus niger* and *Candida albicans*) were 1.0×10^6 cfu / g in beef burgers samples.

With progress of storage period (3 months) at– 18 °C the counts of all tested microorganisms in beef burgers samples slightly decreased. The counts were 4.0×10^4, 5.0×10^4, 3.8×10^3, 8.3×10^4, 7.0×10^4 and 7.5×10^4 cfu / g for *E. coli, Salmonella sp., Bacillus cereus, Staphylococcus aureus,*

Aspergillus niger and *Candida albicans*, respectively. Showing percent decrease of 91.50– 99.60%, which was higher than incase of herbs powder (88.0 – 99.16%).

While, at the end of storage period for 6 months at – 18 °C the counts of all tested microorganisms in beef burgers samples recorded the highest inhibition by different rates. The counts were 4.6 x 10^3, 1.7 x 10^3, 1.3 x 10^2, 0.2 x 10^3, 1.2 x 10^2 and 2.0 x 10^2 cfu / g for *E. coli, Salmonella sp., Bacillus cereus, Staphylococcus aureus, Aspergillus niger* and *Candida albicans*, respectively.

Finally, the obtained results from Tables (5) indicated that the beef burgers with herb mixtures as oils had higher inhibitory effect for all tested microorganisms than that of beef burwith herbs mixture powder during storage period for 6 months at – 18 °C. These results are in agreement with the report of (Fannell, 1996).

5. Organolyptic properties of beef burgers as influenced by addition of herb mixtures and its oils during frozen storage at -18 C for 6 months.

The organolyptic properties of fried beef burgers as influenced by addition of herb mixtures as powder and oils during frozen storage at -18 °C for 6 months are shown in table (6).

It is worthly mentioning notice that at zero time of frozen storage at -18 °C all organolyptic properties (color, flavor, taste, texture and overall acceptability) of fried beef burger recorded the highest organolyptic score (9) of the judging scale.

With progress of storage period (for 3 months) all tested organolyptic properties of all investigation beef burgers slightly decreased. The scores ranged (8 to8.2) and (8.0 to 8.5) for beef burgers with herbs powder and oils, respectively. While at the end of storage period (6 months) a markedly reduction in all organolyptic properties was observed. The scores renged from (7.1 to 7.4) and from (7.4 to 8.0) of fried beef burgers as influenced by addition of herbs mixture as powder and oils, respectively. The obtained data are agreement with those of (Schum, 1971 and Badei *et al.*, 1991).

Finally, it could be concluded that beef burgers with herbs mixture oils was somewhat of better quality than that prepared with herbs mixture powder considering organolyptic properties.

Table (5): Effect of herbs mixture (0.8%) powder and its oils on some microorganisms enumerated in fresh beef burgers during storage period for 6 months (c.f.u. / g).

Tested Organisms / Storage Period (month)	*Escherichia coli*		*Salmonella sp.*		*Bacillus cereus*		*Staph. aureus*		*Aspergillus niger*		*Candida albicans*	
	Powder	Oils	Powder	Oils	Powder	Oils	Powder	Oils	Powder	Oils	Powder	Oils
Zero time (0)	$1.0X\ 10^6$	$1.0X10^6$	$1.0X10^6$	$1.0X10^6$	$1.0X10^6$	$1.0X10^6$	$1.0X10^6$	$1.0X10^6$	$1.0X10^6$	$1.0X10^6$	$1.0X10^6$	$1.0X10^6$
1	$6.2X10^6$	$5.2X10^6$	$8.3X10^5$	$6.2X10^5$	$1.7X10^5$	$2.0X10^5$	$7.0X10^5$	$9.0X10^5$	$6.2X10^5$	$8.3X10^5$	$5.0X10^5$	$8.0X10^5$
2	$4.0X10^5$	$7.2X10^4$	$7.7X10^5$	$7.5X10^5$	$2.3X10^4$	$2.6X10^4$	$2.5X10^5$	$8.5X10^5$	$2.2X10^5$	$4.7X10^5$	$1.3X10^5$	$4.1X10^5$
3	$8.5X10^4$	$4.0X10^4$	$1.0X10^5$	$5.0X10^4$	$8.6X10^3$	$3.8X10^3$	$7.3X10^4$	$8.3X10^4$	$5.5X10^4$	$7.0X10^4$	$6.7X10^4$	$7.5X10^4$
4	$3.3X10^4$	$2.0X10^4$	$9.1X10^4$	$2.7X10^4$	$7.3X10^3$	$2.2X10^3$	$3.0X10^4$	$3.3X10^4$	$2.2X10^4$	$3.3X10^4$	$2.0X10^4$	$4.0X10^4$
5	$4.8X10^3$	$8.2X10^3$	$8.0X10^4$	$4.0X10^3$	$3.1X10^3$	$6.0X10^2$	$3.2X10^3$	$1.3X10^4$	$6.0X10^3$	$6.0X10^3$	$7.2X10^3$	$7.2X10^3$
6	$1.4X10^3$	$4.6X10^3$	$1.3X10^4$	$1.7X10^3$	$1.2X10^3$	$1.3X10^2$	$1.5X10^3$	$0.2X10^3$	$2.8X10^3$	$1.2X10^2$	$1.7X10^3$	$2.0X10^2$

Table (6): Organolyptic properteis of fried beef burgers as influenced by addtion of herbs mixture (0.8%) during frozen storage at -18 °C for 6 months.

Items / Storage Period (month)	Color		Flavor		Taste		Texture		Overal acceptability	
	Powder	Oils	Powder	Oils	Powder	Oils	Powder	Oils	Powder	Oils
Zero time (0)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
1	8.8	8.6	8.6	8.8	8.8	9.0	8.6	8.8	8.7	8.9
2	8.2	8.1	8.2	8.4	8.4	8.7	8.1	8.6	8.2	8.6
3	8.0	8.0	8.0	8.2	8.2	8.5	8.0	8.1	8.0	8.2
4	7.8	8.0	7.8	8.0	8.0	8.4	7.8	8.0	7.8	8.0
5	7.5	7.4	7.6	7.7	7.7	8.1	7.6	7.7	7.6	7.7
6	7.1	7.4	7.4	7.6	7.3	8.0	7.1	7.4	7.2	7.4

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تأثير مسحوق مخلوط الأعشاب وزيوتها على جودة البيف برجر

أبو الفتح البديوى ــ عصام الدين حافظ ــ هالة عزازى على
قسم الصناعات الغذائية ــ كلية الزراعة ــ جامعة المنوفية

الملخص العربى

تم فى هذا البحث دراسة تأثير استخدام مسحوق مخلوط الأعشاب (حبة البركه ، النعناع ، البردقوش ، البابونج وحصى البان) وزيوتها بنسبة ٠,٠ ، ٠,٤ ، ٠,٨ ، ١,٢ ، ١,٦ جم/لتر.على جودة البيف برجر. وتم تقدير التركيب الكيماوى لعينات البيف برجر الطازجة. كذلك تم دراسة تأثير التخزين المجمد على ــ ١٨ م° لمدة ٦ شهور للبيف برجر المحتوى على مخلوط الأعشاب فى الصورة الجافة وزيوتها على التركيب الكيماوى وبعض الخصائص الطبيعية والجودة الميكروبيولوجية. كذلك تم التقيم الحسى لعينات البيف برجر المختلفة. وأظهرت النتائج المتحصل عليها مايلى. عينات البيف برجر الطازج الكنترول (بدون أعشاب) سجلت أعلى قيم للرطوبة والبروتين والرماد. بينما عينات البيف برجر الطازج المحتوية على مخلوط الأعشاب في الصورة الجافة سجلت أعلى قيم للألياف. وأعلى نسبة دهن وكربوهيدرات وطاقة كانت في عينات البيف برجر المجهز مع زيوت الأعشاب التي أظهرت أقل نسبة بروتين ورماد. وقد لوحظ عند التخزين المجمد على ــ ١٨ م° لمدة ٦ شهور انخفاض ملحوظ في قيم الرطوبة والبروتين بينما حدثت زيادة معنوية في قيم كل من الدهن والرماد وألياف والكربوهيدرات والطاقة.

ومن ناحية أخرى وجد أن عينات البيف برجر المضاف لها مخلوط الأعشاب في صورة زيت سجلت أقل قيم لحمض الثيوباربيتيوريك (TBA) بالمقارنة بعينات البيف برجر المضاف لها مخلوط الأعشاب في صورة جافة أو بدون أعشاب. كذلك لوحظ عدم وجود فروق معنوية في الخصائص الطبيعية (القدرة على إمساك الماء ، البلاستيكية ، الفقد أثناء الطهين ، الناتج المتحصل عليه) لعينات البيف برجر .

كذلك أظهرت النتائج المتحصل عليها من دراسة الجودة الميكروبيولوجية أن عينات البيف برجر المحتوية على زيوت الأعشاب لها أعلى تأثير مثبط للميكروبات المختبرة بالمقارنة بتلك العينات المحتوية على مخلوط الأعشاب في الصورة الجافة. وفى النهاية يمكن القول من التقييم الحسي بأن عينات البيف برجر المحتوية زيوت الأعشاب لها قيم حسية مرتفعة نسبيا بالمقارنة بتلك العينات المحتوية على مخلوط الأعشاب في الصورة الجافة أثناء التخزين المجمد لمدة ٦ شهور.