Suggested formulas rich in certain nutrients necessary for the prevention of major depressive disorder (MDD)

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العدد التاسع والثلاثون يوليو 2024

الجزء الأول

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Abstract :

Major depressive disorder (MDD) is a common, chronic condition that imposes a substantial burden of disability globally. As current treatments are estimated to address only one-third of the disease burden of depressive disorders and since the majority of depressed patients do not seek treatment, a need has emerged for new approaches to prevent depression or to delay its progression and alleviate its symptoms. Thus, this paper aims to prepare some natural and healthy formulations to help patients with depression. The results of this study showed a significant increase in tryptophan content for all of the newly processed formulas. Moreover, the newly processed cake sample revealed an increase in protein, fiber and fat and a decrease in carbohydrates. Newly formulated cookies also showed an increase in protein, fiber and fat content; however, carbohydrates content was not affected by the new formulation. In the newly processed buttermilk (Rayeb), protein and fibers increased significantly, while calories and fats decreased, which indicates a healthier product. As for the newly suggested turkey rolls, the formula contained more fibers and carbohydrates and less protein and fat. Finally, the suggested cake, cookies and buttermilk formulas showed a significant increase in PUFA content (n-3 and n-6), UFA/SFA and P/S values, while these formulas revealed a decrease in SFA and MUFA content (n-9), except for the buttermilk formula as it also showed a significant increase in MUFA. The sample of turkey rolls revealed increase in n-3 PUFA, n-9 MUFA and a higher value of UFA/SFA but showed a decrease in n-6 PUFA, and as a result, it showed a lower value of P/S. The study recommends including the new suggested products in the daily diets of patients with MDD.

Key words: Depression - omega-3 – tryptophan – amino acids – formula – banana flour – soy flour – sensory evaluation

Introduction:

Major Depressive Disorder (MDD) is globally one of the most prevalent psychiatric diseases, diagnosed when an individual has a persistently low or depressed mood, anhedonia or decreased interest in pleasurable activities, feelings of guilt or worthlessness, lack of energy, poor concentration, appetite changes, psychomotor retardation or agitation, sleep disturbances, or suicidal thoughts. Per the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition **(American Psychiatric Association, 2013)**, an individual must have five of the above-mentioned symptoms, of which one must be a depressed mood or anhedonia causing social or occupational impairment, to be diagnosed with MDD.

MDD was ranked as the third cause of the burden of disease worldwide in 2008 by the WHO, which has projected that this disease will rank first by 2030 **(Bains *et al*., 2022)**.

The management of depression involves a comprehensive assessment and the proper establishment of a diagnosis. The assessment must be based on detailed history, physical examination and mental state examinations. History must be obtained from all sources, especially the family **(Gautam *et al*., 2017)**.

MDD continues to remain one of the most prevalent psychiatric diseases globally. Despite multiple trials of conventional therapies, a subset of patients fail to have adequate benefit from treatment **(Unadkat *et al*., 2024)**. For people who have been struggling with mental illness for years, if the limited treatment options of therapy and prescription medication aren't effective for them, they're often left feeling hopeless when seeking relief **(Tschetter, 2024)**.

Although the safety and tolerability of antidepressants have improved considerably over the past two decades. Nevertheless, antidepressant side effects are still common and problematic (**Kelly *et al*., 2008**). Any medical treatment has potential safety risks, however, and these risks should also be considered when prescribing SSRIs **(Mortensen & Andersen, 2022).** The majority of patients treated with contemporary agents experience one or more bothersome side effects. These side effects often create barriers to achieving depressive remission, as well as to preventing relapse and recurrence **(Bull *et al*., 2002)**.

Kelly *et al*., (2008) mentioned that the most common side effects include sexual dysfunction, gastrointestinal problems, sleep disturbance, apathy, and fatigue. Therefore, antidepressant side effects are a common

clinical challenge, often jeopardizing treatment adherence and quality of life. Hence, there is a need to find alternative treatments to avoid or alleviate the side effects of these antidepressants.

Nutrition plays a critical role in the prevention and management of many chronic diseases, including heart disease, diabetes, and cancer. A healthy diet that emphasizes whole, minimally processed foods and limits or eliminates processed foods, saturated and trans fats, and added sugars can help reduce the risk of chronic diseases and improve overall health. **(Lateef & Lucas, 2023).**

There are at least three mechanisms by which nutrition could be effective in improving mental health. One of them reflects in modifying dietary intake or supplementing diets with single or multiple vitamins and minerals may correct existing nutrient deficiencies that contribute to poor mental health **(Bondar & Wisner, 2005)**. Natural cures (drugs) have different active compounds that may help to treat the condition holistically acting on the body of the patient. The more that depression affects the whole body, causing multi-organ dysfunction, the need for effective and well tolerated remedies for depression has influenced scientists to more strict analysis of herb drugs and natural products which are traditionally used for depression treatment **(Muszyńska *et al*., 2015)**.

The most influential neurobiological discoveries related to depression have probably been neurotransmitter-related ('neurochemical') abnormalities, with the monoamines (serotonin, noradrenaline and dopamine) **(Kaltenboeck & Harmer, 2018)**, that is consequently affected by enzymes involved in their degradation or synthesis of their precursor tryptophan **(Vaváková *et al*., 2015)**.

Initial studies determined that gut microbiota can regulate host tryptophan levels, which is a main serotonin precursor. A dysfunctional serotonergic system is considered to be one of the main factors contributing to the development of depression **(Lukić *et al*., 2019)**. An influence of gut microbiota on behavior is becoming increasingly evident, via a variety of proposed mechanisms including changes to tryptophan uptake and serotonin synthesis **(Jenkins *et al*., 2016)**. Mental disorders including depression and anxiety are often comorbid with gut problems, suggesting a bidirectional relationship between mental health and gut function. The potential of modulating the microbiome-gut-brain axis, and subsequently mental health, through the use of functional foods, is an emerging and novel topic of interest. Fermented foods are considered functional foods due to their putative health benefits. The process of microbial fermentation converts food substrates into more

nutritionally and functionally rich products, resulting in functional microorganisms (probiotics), substrates that enhance the proliferation of beneficial bacteria in the gut (prebiotics), and bioactive components (biogenics) **(Aslam *et al*., 2020)**.

Omega-3 fatty acids are polyunsaturated, containing more than one double bond. They are known to be important for a normal metabolism **(Bhat & Ara, 2015)**. There are number of studies which shows that omega-3 fatty acids are proving to be very effective against the treatment of major depression disorder and other psychiatric disorders **(Mehdi *et al*., 2023)**. A study showed that it can be concluded that patients with a current depressive episode (especially the more severe cases with comorbid anxiety) have circulating n-3 PUFA levels lower than those in remission and healthy controls **(Thesing *et al*., 2018)**.

This work was conducted to process nutritional formulas rich in these nutrients to help prevent depression, delay its progression, and alleviate its symptoms.

Materials and Methods

1. Materials:

Organic green bananas were obtained from local farmers in Ashmoun, Menoufia Government, Egypt. Soy flour was purchased from the soy factory, Food Technology Research Institute, Agricultural Research Center, Cairo, Egypt. Almonds, walnuts, hazelnuts, dried apricots and prunes were purchased from Abu Auf Food Industries, Cairo, Egypt. Milk, soy milk, Greek yoghurt, buttermilk avocados, oat flour, butter, sugar, fresh mushrooms, broccoli, baking powder and yellow, red and green bell peppers were purchased from Spinneys, Mall of Arabia, Giza, Egypt. Brown sugar was purchased online from Imtenan for the production and sale of nutritional and healthy products, Cairo, Egypt. Turkey breasts, apples, strawberries and bananas were purchased from Hyperone, Sheikh Zayed City, Giza, Egypt. Asparagus was from Carrefour, Dandy Mega Mall, Giza, Egypt. Vanilla extract, eggs, white chocolate chips, wheat flour, bread crumbs and spices were purchased from the local market in Ashmoun, Menoufia Government, Egypt.

2. Methods

2.1. Samples preparation

2.1.1. Banana flour preparation

Green banana flour was produced from whole organic green bananas, including their peel. Organic hard green (unripe) bananas were washed thoroughly, left to air dry, and then cut into 3 ml slices. The slices were dried at 50 °C in a convection oven, ground into a fine

powder, either using a blender or food processor, and then stored in sealed plastic containers until further analysis and usage.

2.1.2. Cake samples preparation

A control cake sample was prepared according to the method mentioned in **Lostie *et al*., (2002)** with some modifications in the recipe.

The suggested avocado cake was prepared as follows: **Ingriedients**: 300g avocados, 25g coconut oil, 110g granulated sugar, 1 tsp vanilla extract, 4 large eggs, 130g soy flour, 1 tsp salt, ½ tsp baking powder, 20g dry apricots, 15g dry prunes, 100g full fat milk, 150g soy milk and 120g nuts almonds and walnuts. **Preparation**: the cream is prepared by draining excess water from yoghurt then in a food possessor add the avocados and sugar and mix well. Add the yoghurt then mix until combined. For the cake batter mash 100 grams of avocado with 25 grams of coconut oil. Meanwhile, preheat the oven to 170°C. Line a 20-cm round cake pan with parchment paper and sprayed with oil. Whip 4 eggs in a stand mixer until foamy, then gradually add the sugar and continue whipping until the eggs fall off the whisk in a thick ribbon. Add the vanilla extract and whisk again untill combined. Fold the avocado mash into the mixture. Then gradually sift the dry ingredients over mixture while simultaneously folding in until just combined. Add dry fruits and about 40g of mixed nuts to the batter. Mix well. Then gradually add the milk mixture and fold gently. Pour the batter into the prepared pan. Bake the cake for about 40 minutes or until a toothpick inserted into the middle comes out clean. Remove from the oven, let cool for 5 minutes, then invert onto a cooling rack and carefully peel away baking paper, then leave to cool completely. Slice the cake into two layers. Place 1 cake layer on a cake stand, or serving plate. Evenly cover the top with prepared avocado yoghurt cream. Top with sliced fresh avocados then sprinkle about 20g of ground mixed nuts. Brush on another thin layer of cream. Then top with the 2nd cake layer and evenly cover the top with the remaining cream all over the top and sides. Garnish the cake with a flower made from thin avocado slices and center it on top of the cake. Dust the sides of the cake with remaining ground nuts.

2.1.3. Cookies samples preparation

A control cookie sample was prepared according to the method of **AACC (2000),** with some modifications in the recipe.

Suggested avocado cake was prepared as follows: **Ingriedients**: 60g unsalted melted butter, 50g brown sugar, 1 tsp vanilla extract, 1 large egg, at room temperature, 120g banana flour, 30g oat flour, ¼ tsp salt, ½ tsp baking soda, 5g white chocolate chips for decoration and 70g mixed nuts almonds, walnuts and hazelnuts. **Preparation**: Preheat the oven to

375 degrees F. Mix sugar and butter together in a large bowl. Add in egg and vanilla. Stir flour, baking soda, and salt together in a small bowl. Add dry ingredients to the mixture, and mix until only just combined. Add about 60g of the mixed nuts. Fold and mash until incorporated. Scoop the cookies out onto parchment paper lined baking sheet, 2 scoops per cookie. Garnish the top of each cookie with white chocolate chips and the rest of the nuts. Bake in the preheated oven until the edges are golden, 8 to 10 minutes. Cool on the baking sheets briefly before removing them to a wire rack to cool completely.

2.1.4. Buttermilk samples preparation

Plain full cream buttermilk (a commercial product) was purshesed as a control sample.

The suggested fruit buttermilk was prepared as follows: **Ingriedients**: 180g Greek yogurt, 100g avocado, 150g strawberries, 120g apples, 100g bananas, 250g buttermilk, 100g soy milk and 30g honey. **Preparation**: place all the ingredients in a blender and purée until smooth. Strain the mixture through a sieve to remove all the seeds and skins from the fruits.

2.1.5. Turkey samples preparation

A control breaded chicken panne sample was prepared according to the method mentioned in **Moschonas *et al.*, (2000)** with some modifications in the recipe.

Suggested turkey rolls were prepared as following: **ingriedients**: (all-purpose flour, salt & pepper, eggs, yogurt, vegetables (broccoli, asparagus, mushrooms and green, yellow and red bell peppers), breadcrumbs, seasonings and oil: for frying. **Preparation**: to prepare the marinade, bring a deep dish and mix yoghurt and the seasoning well. With a sharp knife, butterfly each fillet, then put the slices in the marinade. Prepare the vegetables for the filling: to a skillet/frying pan add the oil over medium heat. Add the broccoli and sauté for a minute. Add the bell peppers and cook until they soften. Turn heat down to medium low, add the mushrooms and asparagus, stir for 1 minute, toss well to mix and cook until mushrooms and asparagus has wilted. Remove and transfer to a bowl, let it cool. Add 1 tablespoon of the filling to each turkey breast slice. Fold the ends and roll the chicken tightly over the filling. Secure each roll with a toothpick. Dip the rolls in the flour mixture. Then, coat both sides with eggs. Transfer the coated rolls into the breadcrumbs dish. Add the breaded rolls to a hot pan filled with oil and cook until the crust is golden brown and the internal temperature reaches 165F.

2.2. Analytical methods

2.2.1. Chemical composition:

Raw materials and final products were chemically analysed for moisture and ash according to **AACC (2000).** International methods are 44-15.02 (Moisture-Air Oven Method) and 08-01.01 (Ash Basic Method) respectively. Lipids and crude protein (Nx5.7) contents were analysed according to the methods described in **AOAC (2000)**; Lipids were extracted in a Soxhlet apparatus using N-hexane as a solvent. Total carbohydrates were calculated by differences as mentioned by **Fraser & Holumes (1959)**.

% Total carbohydrates (on dry basis) = 100 – (%Ash + %Fat +%Protein + %Fiber).

2.2.2. Determination of Fatty acid composition of cake, cookies and turkey samples:

Fatty acid methyl esters were prepared from total lipid by using the rapid method according to the method of **ISO 12966-2, (2017)**. Procedure

2.2.3. Determination of Fatty acid composition of buttermilk samples:

For the evaluation and identification of fatty acids profile for the samples using gas chromatography (GC, Perkin Elmer Auto System XL) based on **Zahran and Tawfeuk (2019)**.

2.2.4. Determination of Amino acid composition:

2.2.4.1. Preparation and identification of free amino acids by using amino acid analyzer:

One gram of each defatted plant powder was extracted by boiling under reflux with 50 ml of 50 % ethanol 3 times (each time for 3 hours). The combined ethanolic solutions were filtered and treated with trichloroacetic acid solution (10 %) for clarification. The super-natant fluid was concentrated under reduced pressure to 5 ml. The residue was washed with distilled water. The volume of the filtrate was adjusted to 100 ml using distilled water. Five ml from diluted sample were dried under vacuum at 70°C, then dissolved in 5 ml loading buffer (0.2 N sodium citrate buffer pH 2). The sample was filtered through 0.45 micropore filter and injected in the amino acid analyzer **(Pellet and Young, 1980)**.

2.2.4.2. Protein amino acids:

2.2.4.2.1. Preparation and identification of protein amino acids:

The hydrolyzed protein amino acids were determined according to the method described by **Pellet and Young (1980)**.

2.2.4.2.2. System of amino acid analyzer (SYKAM system high performance analyzer):

- Column: Na high performance column 25cm.
- Injected
- and separated area were obtained using SYKAM s2100 recording integrator.

2.2.4.3. Tryptophan content determination:

Tryptophan content was determined according to the method described in the Handbook of Dairy Foods Analysis by **Nollet & Toldra (2009).** Tryptophan is an essential amino acid, which is easily destroyed by oxidation promoted by Maillard products or iron. To analyze tryptophan sample hydrolysis with methanesul fonic or mercaptoethanesulfonic acids, alkaline or enzymatic hydrolysis are recommended to be better than HCl hydrolysis. Afterward, there are several possible analytical methods like cation-exchange chromatography with postcolumn derivatization with OPA, RP-HPLC previous or without derivatization, and direct UV or fluorescence detection or even by GLC. Direct determination of tryptophan without separation or even without hydrolysis of the sample are based on either the acid ninhydrin method or the tryptophan forth-derivative UV-absorption spectrum.

2.2.4.3.1. Alkaline Hydrolysis of samples:

The alkaline hydrolysis with 4.2 M of either NaOH, KOH, LiOH, or Ba(OH)2, with or without the addition of 1% (w/v) thiodiglycol for 18 h at 110°C in a conventional oven or 18 min in a microwave oven has been recommended for a better tryptophan determination, especially for food samples with high carbohydrate content like dairy products.

2.3. Sensory evaluation:

Control and suggested formula samples were organoleptically evaluated for their external and internal properties by 20 staff members in the Home Economics Dept. Faculty of Specific Education, Menoufia University, Ashmoun. Scores were as follows: Very good: 8<9 – Good: 7<8 - Fair: 6<7 – Week: 5<6 – Rejected: 4<5

(Watts *et al*.,1989).

2.4. Statistical analysis:

Analysis of variance was conducted for the data in accordance with procedures described by **Steel & Torrie (1980)**. L.S.D. at 5% level of significance was used to compare between means.

Results and discussion

Adequate nutrition is needed for countless aspects of brain functioning. While in its early stages, converging evidence from laboratory, population research, and clinical trials now suggests that dietary patterns and specific dietary factors may influence the risk of depression. Thus, the main objective of this study lies within providing high nutritional value products with a positive impact on mental health instead of consuming unhealthy, high sugar foods with low nutritional value. Analyses of newly processed products revealed the following:

1. Avocado cake:

Data presented in **Table (1)** show the chemical composition of the control and suggested new formula as well as their evaluation when consumed by young people of both sexes (males and females, ages 19-50). Nutrients in cake are calculated for 150g of product, since it is reasonable that subjects in this research, male or female 19-30 years old are expected to eat more than 100 g; at least 150g

It is clear that when 150g of cake were consumed, water intake reduced somewhat from 72.705 to 69.32g (by 3.39g). As will be later indicated, such a decrease did not affect the sensory evaluation of the new formulated cake considering texture and overall acceptability **Table (17).** This resulted in 18.21g decrease in the carbohydrate content of the newly formulated cake, but as in case of water content, this decrease didn't affect the sensory characteristics of the cake, on the contrary, sensory characteristics increased.

Consumption of 150g of the newly suggested formula was favorable considering the level of important nutrients. The new formulated cake showed a 6.68g increase in protein which means 52.62% increase compared to control sample. As present of DRI, it was 34.55% of DRI and 42.06% of DRI as regards males and females 19-30 years old.

The case, however, was not so welcomed since intake of fat increased from 5.4g to 13.47g (by 8.07g), but when data of FA was reviewed, it seems possible that the increase was in good fat. Moreover, the new formula had better overall acceptability and better aroma, taste, color, texture than control **Table (17)**.

When consuming the new formulated cake formula total consumed fiber increased from 1.35 to 5.58g (by 4.32g). This didn't affect the sensory characteristics of cake. Still after production of the new suggested cake the fiber level is far away from the DRI (DRI is 38g for males and 25g for females). As far as the author was aware that the consumption of fibers in Egypt is low compared with DRI values.

Table (1): Chemical composition of cake samples

Chemical composition (g/150g product)	Control			Suggested new formula						
	Content	Male (19-30 years)	Female (19-30 years)	Content	Male (19-30 years)			Female (19-30 years)		
		% of DRI	% of DRI		% of control	DRI	% of DRI	% of control	DRI	% of DRI
Moisture (g/150g)	72.705			69.32	95.34			95.34		
Fat (g/150g)	5.4	6.1	8	13.47	249.58	88.4	15.24	249.58	67.5	19.96
Ash (g/150g)	0.69			3.23	468.47			468.47		
Crude fiber (g/150g)	1.35	3.55	5.4	5.58	413.33	38	14.68	413.33	25	22.32
Crude protein (g/150g)	12.675	22.63	27.55	19.35	152.66	56	34.55	152.66	46	42.06
Total carbohydrates (g/150g)	57.18	10.57	13.93	38.97	68.15	540.5	7.20	68.15	410.4	9.49
Total Calories (kcal)	328.02	10.3	13.48	354.57	108.09	3181.9	11.14	108.09	2433.03	14.57

Data of **Table (2)** show the FA composition of the fat extracted from the control and suggested new formula of cake. It is clear that the evaluation of FA composition revealed that the new suggested cake is healthier than control. This is because the new cake was more unsaturated (64.06%) than the control sample (42.15%). Also saturated FA (35.69%) was less than in control (58.04%). Unsaturated/Saturated FA was higher in the new formulated cake (1.79) compared with that of control (0.72). Polyunsaturated fatty acids (PUFA) were much greater in newly formulated cake (38.76%) in comparison with the control sample (15.18). P/S value (polyunsaturated/saturated) was much greater for new formulated cake (1.08) than the control (0.26).

Table (2): Fatty acid profile of cake samples

Fatty acid profile (%)	Control	Suggested new formula	
	Content	Content	% of control
Butyric acid (C4:0)	0.02	0.02	100
Caproic acid (C6:0)		0.42	
Cprylic (C8:0)	34.49	1.74	5.04
Cpric (C10:0)	0.04	1.61	4025
Lauric (C12:0)		9.52	
Myristic (C14:0)	0.23	4.87	2117.39
Myristoleic (C14:1)	0.05	0.2	400
Pentadecanoic (C15:0)	0.05	0.23	460
Pentadecenoic (C15:1)		0.05	
Palmitic (C16:0)	17.22	12.76	74.09
Palmitoleic (C16:1)	1.44	1.35	93.75

Heptadecanoic (C17:0)	0.15	0.17	113.33
Heptadecenoic (C17:1)	0.08	0.08	100
Stearic (C18:0)	5.8	3.8	65.51
Oleic (C18:1)	25.21	23.43	92.93
Linoleic (C18:2)	14.32	28.78	200.97
Linolenic (C18:3)	0.86	9.27	1077.9
Stearidonic acid (C18:4)		0.71	
Arachidic (C20:0)	0.02	0.47	2350
Gadoleic (C20:1)	0.19	0.19	100
Behenic (C22:0)	0.02	0.08	400
UFA (unsaturated fatty acids)	**42.15**	**64.06**	151.98
SFA (saturated fatty acids)	**58.04**	**35.69**	61.49
Omega-3	**0.86**	**9.27**	1077.9
Omega-6	**14.32**	**28.78**	200.97
Omega-9	**26.97**	**25.3**	93.8
MUFA (mono unsaturated fatty acid)	**26.97**	**25.3**	93.8
PUFA (poly unsaturated fatty acid)	**15.18**	**38.76**	255.33
Unsaturated/saturated	**0.72**	**1.79**	248.61
P/S (poly unsaturated/ saturated)	**0.26**	**1.08**	417.69

Because Omega-6 and Omega-3 FA have special importance they were separately evaluated in **(Table 3)**.

Table (3): Evaluation of EFA of cake samples

EFA (%)	**Control**			**Suggested new formula**						
	Content	**Male (19-30 years)**	**Female (19-30 years)**	**Content**	**Male (19-30 years)**			**Female (19-30 years)**		
		% of DRI	**% of DRI**		**% of control**	**DRI**	**% of DRI**	**% of control**	**DRI**	**% of DRI**
n-6	14.32	102.28	130.18	28.78	200.97	14	205.57	4877.96	11	261.63
n-3	0.86	53.75	78.18	9.27	1077.9	1.6	579.37	26485.71	1.1	842.72

Results from **Table (3)** indicated that n-6 (C18:2 FA) and n-3 (C18:3 FA) were each markedly higher in the new formulated cake. This was clear when reviewing values as % of DRI. Then the new cake was undoubtedly healthier than control.

Omega-9 FA did not differ much between the two cakes, being somewhat lower for the new cake (24.78) compared to that of control (26.65). Actually, the difference is not great, knowing also that the importance of Omega-9 is just recently discovered.

Data of **Table (4)** show the EAA (essential amino acids) of control and newly suggested cake.

Table (4): Essential amino acid profile (EAA) of cake samples

Amino acid profile (g/100gm protein) Essential amino acids:	Control		Suggested new formula			
	Content	% of DRI	Content	% of control	DRI	% of DRI
Tryptophan	0.58	82.85	6.31	1087.93	0.7	901.42
Threonine	1.88	69.62	1.95	103.72	2.7	72.22
Isoleucine	2.32	92.8	3.1	133.62	2.5	124
Leucine	4.1	74.54	5.56	135.6	5.5	101.09
Lysine	2.48	48.62	7.88	317.74	5.1	154.51
Valine	2.85	89.06	4.53	158.94	3.2	141.56
Histidine	1.23	68.33	4.52	367.47	1.8	251.11
Methionine + Cysteine	2.39	95.6	8.37	350.2	2.5	334.8
Phenylalanine + Tyrosine	4.32	91.91	5.65	130.78	4.7	120.21
PER1	**0.989**		**1.55479**			
PER2	**1.3**		**2.2255**			
B.V1%	**59.504**		**65.4619**			
B.V2%	**62.851**		**72.524**			

As reported by **Strasser *et al.*, (2016)** it is recommended for healthy adults to consume around 5mg/kg body weight per day of tryptophan to avoid depression. From **Table (4)** 30 years old, 63 Kg body weight females needs 315 mg tryptophan (per day) to avoid depression. New formulated cake is richer in tryptophan, as it can cover the needs of tryptophan when taking 100 g of cake because its content is 6.31g/100g. As compared with DRI 100g of control cake seems to be deficient in all EAA (when consuming 100g of cake) but when consuming 100g of new cake only phenylalanine + tyrosine is deficient, but when consuming 150g of new cake, the needs of all EAA were covered only threonine was less than DRI, PER $_{1,2}$ and B.V $_{1,2}$ were higher for new cake than the control formula.

2. Cookies:

Control and new suggested cookies were analysed at 150g consumption to show more clearly the effect and credibility of processing the new product. Actually, males and females may consume at least 150g of cake and cookies (not just 100g). Results in **Table (5)**

show the results of analysing 150g of control and new cookies. Firstly, the new product revealed decrease in moisture from 35.05 to 22.86g by 12.19g. This practise **Table (18)** did not affect the sensory characteristics, which showed improvement of all qualities. Furthermore, it expected that at less moisture content the new product will be stored better.

The fat increased from 30.93% (control) to 37.86% (new cookies), i.e. by 6.93%. The increase of fat by about 7% will increase T. calories of cookies (150g) by about 67 calories (from 605.41 to 672.34 Kcal.). This amount (67.24 kcal) did not affect markedly the percent increase of % of DRI of male and female (table 5). The same could be said about the changes of carbohydrates.

For proteins, the results **Table (5)** revealed 5.09g increase (in 150g of product); from 1.695 to 6.75g when new cookies were processed (3.39%). The increase was exactly small, but it means that the chemical composition was not badly affected when new cookies were made.

Table (5): Chemical composition of cookies samples

Chemical composition (g/150g product)	Control			Suggested new formula						
	Content	Male (19-30 years)	Female (19-30 years)	Content	Male (19-30 years)			Female (19-30 years)		
		% of DRI	% of DRI		% of control	DRI	% of DRI	% of control	DRI	% of DRI
Moisture (g/150g)	35.05			22.86	65.22			65.22		
Fat (g/150g)	30.93	34.98	45.82	37.86	122.41	88.4	42.83	122.41	67.5	56.09
Ash (g/150g)	0.54			0.81	150			150		
Crude fiber (g/150g)	1.695	4.46	6.78	6.75	398.23	38	17.76	398.23	25	27
Crude protein (g/150g)	9.66	17.25	21	10.4	107.71	56	18.58	107.71	46	22.62
Total carbohydrates (g/150g)	72.07	13.33	17.56	72.49	100.58	540.5	13.41	100.58	410.4	17.66
Total Calories (kcal)	605.41	19.02	24.88	672.34	111.05	3182	21.12	111.05	2433.03	27.63

The data represented in **Table (6)** illustrates the FA levels in new and control cookies. It is clear that the FA composition of new product was better than that of control product. This is because in both control and new cookies unsaturated FA were less than the saturated FA. Nevertheless, the new product showed higher value (0.87) of UFA/SFA when compared with control (0.54) and P/S value of the new product (0.36) was higher than of control (0.08). However, since the body

contains saturated fats normally, they are a vital component of a healthy diet when they are naturally occurring and eaten in the context of a minimally processed diet **(Gershuni, 2018)**

Therefore, we cannot consider saturated fat as pure evil. Nevertheless, we should remember that from **Table (6)** UFA/SFA and P/S values were more in the new cookies compared with the control sample. This is confirmed by the results of **Table (7)** since levels of n-6 and n-3 FA were both higher in the new suggested formula compared with the control.

Table (6): Fatty acid profile of cookies samples

Fatty acid profile (%)	Control	Suggested new formula	
	Content	Content	% of control
Butyric acid (C4:0)	3.85	0.33	8.57
Caproic acid (C6:0)	2.37	1.06	44.72
Cprylic (C8:0)	1.42	1.13	79.57
Cpric (C10:0)	3.006	1.95	64.87
Lauric (C12:0)	3.05	11.94	391.47
Myristic (C14:0)	8.91	8.37	93.93
Myristoleic (C14:1)		0.46	
Pentadecanoic (C15:0)		0.49	
Pentadecenoic (C15:1)		0.05	
Palmitic (C16:0)	28.53	19.34	67.78
Palmitoleic (C16:1)	2.32	0.7	30.17
Heptadecanoic (C17:0)	0.63	0.34	53.96
Heptadecenoic (C17:1)		0.14	
Stearic (C18:0)	12.76	7.4	57.99
Oleic (C18:1)	27.65	25.41	91.89
Linoleic (C18:2)	4.37	11.98	274.14
Linolenic (C18:3)	0.89	5.95	668.53
Stearidonic acid (C18:4)		1.33	
Arachidic (C20:0)	0.16	0.45	281.25
Gadoleic (C20:1)	0.11	0.16	145.45
Behenic (C22:0)		0.19	
UFA (unsaturated fatty acids)	**35.34**	**46.18**	130.67
SFA (saturated fatty acids)	**64.68**	**52.99**	81.92
Omega-3	**0.89**	**5.95**	668.53
Omega-6	**4.37**	**11.98**	274.14
Omega-9	**30.08**	**26.92**	89.5
MUFA (mono unsaturated fatty acid)	**30.08**	**26.92**	89.5
PUFA (poly unsaturated fatty acid)	**5.26**	**19.26**	366.16
Unsaturated/saturated	**0.54**	**0.87**	161.11
P/S (poly unsaturated/ saturated)	**0.08**	**0.36**	454.33

Table (7): Evaluation of EFA of cookies samples

EFA (%)	Control			Suggested new formula						
	Content	Male (19-30 years)	Female (19-30 years)	Content	Male (19-30 years)			Female (19-30 years)		
		% of DRI	% of DRI		% of control	DRI	% of DRI	% of control	DRI	% of DRI
n-6	4.37	31.21	39.72	11.98	274.14	14	85.57	274.14	11	108.9
n-3	0.89	55.62	80.9	5.95	668.53	1.6	371.87	668.53	1.1	540.9

Data represented in **Table (8)** Show the EAA in cookies of the control and new samples. It could be noticed that with the exception of tryptophan all EAA decreased in the new formula product compared to the control. When contents were calculated based on percent of DRI, the last value receded for phenylalanine + tyrosine (70.49% of DRI), while for EAA (other than tryptophan) % DRI decreased to 70.44 – 77.87%. Since % of DRI did not decrease to less than 70% of DRI, it may be claimed that the protein in the new product was of high quality protein (not the highest). Lysine (as tryptophan) increased in the new product appreciably (to 77% of DRI). In the new product wheat flour (all propose flour) was replaced by banana and oat flour. According to **Lindseth *et al.*, (2015)**, increasing the content of tryptophan in the diet resulted in less depression symptoms and better mood states. The results of **Table (8)** tryptophan in new product revealed 602.45% (tryptophan) than of control cookies.

$PER_{1,2}$ and $B.V_{1,2}$ were less in the new product than control, but as % of DRI none of the EAA revealed less than 92.75% value.

Table (8): Essential amino acid profile (EAA) of cookies samples

Amino acid profile (g/100gm protein) Essential amino acids:	Control		Suggested new formula			
	Content	% of DRI	Content	% of control	DRI	% of DRI
Tryptophan	1.22	174.28	7.35	**602.45**	0.7	**1050**
Threonine	3.39	125.55	2.64	**77.87**	2.7	**97.7778**
Isoleucine	3.9	156	2.99	**76.66**	2.5	**119.6**
Leucine	7.24	131.63	5.1	**70.44**	5.5	**92.7273**
Lysine	3.78	74.11	40.713	**1077.06**	5.1	**798.294**
Valine	4.59	143.43	3.55	**77.34**	3.2	**110.938**
Histidine	2.17	120.55	2.12	**97.69**	1.8	**117.778**
Methionine + Cysteine	4.72	188.8	3.359	**71.16**	2.5	**134.36**
Phenylalanine + Tyrosine	8.32	177.02	5.865	**70.49**	4.7	**124.787**
PER1	**2.20995**		**1.503**			
PER2	**2.469**		**1.62**			
BV1%	**72.3607**		**64.921**			
BV2%	**75.091**		**66.188**			

3. Buttermilk (Rayeb) samples:

Protein of control Rayeb sample was 4.81%, but it was raised to 14.04% in the new product. The new formula becomes a source of protein showing 25.07% of DRI for males and 30.52% of DRI for females, being so little for the control sample showing 8.59 % of DRI and 10.46 % of DRI respectively. This gives the new buttermilk more nutritional value than the control. The differences the case of T. carbohydrates were slight.

Finally, the merit of the new formula was that the product had higher protein and low fat, being of more nutritional value. Moreover, the new formula was of better overall acceptability and better aroma, taste, color, texture than control as shown in **Table (19)**.

Table (9): Chemical composition of buttermilk (rayeb) samples

Chemical composition (g/150g product)	Control			Suggested new formula						
	Content	Male (19-30 years)	Female (19-30 years)	Content	Male (19-30 years)			Female (19-30 years)		
		% of DRI	% of DRI		% of control	DRI	% of DRI	% of control	DRI	% of DRI
Moisture (g/150g)	131.85			126.77						
Fat (g/150g)	4.96	5.61	7.35	0.31	6.34	88.4	0.35	6.34	67.5	0.46
Ash (g/150g)	1.02			0.86						
Crude fiber (g/150g)	0			0.43		38	1.14		25	1.74
Crude protein (g/150g)	4.81	8.59	10.46	14.04	291.65	56	25.07	291.65	46	30.52
Total carbohydrates (g/150g)	7.32	1.35	1.78	7.57	103.48	540.5	1.40	103.48	410.4	1.84
Total Calories (kcal)	93.22	2.92	3.83	89.3	95.79	3181.98	2.80	95.79	2433.03	3.67

The results in **Table (10)** show the FA composition of the control and suggested new formula considering buttermilk. As reported by **Sinclair *et al.*, (2007),** the brain is particularly enriched with polyunsaturated FA represented by omega-6 and omega-3 series. This indicated the importance of FA composition for depression. From the results of **Table (10)** the new buttermilk product was better than the control.

UFA/SFA was higher (0.78) for the new product, while it was lower for the control (0.5). Moreover, PUFA was higher for the new product (6.4) than the control (4.28), also P/S value was more for new formulated buttermilk (0.114) and less for control product (0.064).

From the results of **Table (11)** n-6 of new product was higher by 5.04% than the control (4.28%); % of DRI was also higher for males and females 19-39 years old in new than the control buttermilk. Similarly, n-

3 FA was higher for the new product than the control. This makes buttermilk of new formula is more valid to cure depression compared to control product especially that sensory characteristic improved by such practice **Table (19)**.

Table (10): Fatty acid profile of buttermilk (Rayeb) samples

Fatty acid profile (%)	Control	Suggested new formula	
	Content	Content	% of control
Butyric acid (C4:0)	2.66	1.14	42.85
Caproic acid (C6:0)	2.66	0.9	33.83
Cprylic (C8:0)	2.66	0.63	23.68
Cpric (C10:0)	2.66	1.57	59.02
Lauric (C12:0)	2.73	2.06	75.45
Myristic (C14:0)	10.6	7.98	75.28
Myristoleic (C14:1)		0.69	
Pentadecanoic (C15:0)		0.98	
Pentadecenoic (C15:1)		0.34	
Palmitic (C16:0)	29.63	30.89	104.25
Palmitoleic (C16:1)		2.94	
Heptadecanoic (C17:0)		0.64	
Stearic (C18:0)	13.02	9.24	70.96
Oleic (C18:1)	29.03	32.85	113.15
Linoleic (C18:2)	4.28	5.046	117.89
Linolenic (C18:3)		1.36	
UFA (unsaturated fatty acids)	**33.31**	**43.516**	**130.63**
SFA (saturated fatty acids)	**66.62**	**55.74**	**83.66**
Omega-3	**0**	**1.36**	
Omega-6	**4.28**	**5.046**	**117.89**
Omega-9	**29.03**	**37.11**	**127.83**
MUFA (mono unsaturated fatty acid)	**29.03**	**37.11**	**127.83**
PUFA (poly unsaturated fatty acid)	**4.28**	**6.4**	**149.532**
Unsaturated/saturated	**0.5**	**0.78**	**156**
P/S (poly unsaturated/ saturated)	**0.064**	**0.114**	**178.125**

Table (11): Evaluation of EFA of buttermilk (Rayeb) samples

EFA (%)	Control			Suggested new formula						
	Content	Male (19-30 years)	Female (19-30 years)	Content	Male (19-30 years)			Female (19-30 years)		
		% of DRI	% of DRI		% of control	DRI	% of DRI	% of control	DRI	% of DRI
n-6	4.28	30.57	38.9	5.04	117.75	14	36	117.75	11	45.81
n-3	0	0	0	1.36		1.6	85		1.1	123.63

Data from **Table (12)** show the EAA of the new buttermilk and control products. Female patients should consume 225g (1 cup) of new product to cover 0.315mg of tryptophan (as reported by **Strasser *et al.*, (2016)** it is recommended for healthy adults to consume around 5mg/kg body weight per day of tryptophan to avoid depression). A 63 kg female requires 0.315g/day of tryptophan (5mg/kg) to avoid depression. However, from control product this female should consume 787.5g which is considered a huge amount. Anyhow new buttermilk product was less successful than cakes or cookies products.

Sensory evaluation of the new suggested buttermilk formula was not affected by such formulation, the new formula was of better eating quality **Table (19)**.

Table (12): Essential amino acid profile (EAA) of buttermilk (Rayeb) samples

Amino acid profile (g/100gm protein) Essential amino acids:	Control		Suggested new formula			
	Content	% of DRI	Content	% of control	DRI	% of DRI
Tryptophan	4.26	609.7	1.52	35.78	0.7	218.2
Threonine	4.26	158.07	0.28	6.75	2.7	10.68
Isoleucine	5.17	206.85	0.49	9.5	2.5	19.65
Leucine	9.47	172.18	0.96	10.15	5.5	17.47
Lysine	8.38	164.31	0.85	10.19	5.1	16.75
Valine	6.54	204.43	0.67	10.28	3.2	21.02
Histidine	3.02	167.87	1.014	33.58	1.8	56.37
Methionine + Cysteine	3.24	129.6	1.089	33.63	2.5	43.58
Phenylalanine + Tyrosine	10.22	217.4	1.068	10.45	4.7	22.72

4. Turkey rolls sample:

Data of **Table (13)** show the chemical composition of control and new suggested formula for depression patients.

It could be noticed that processed new turkey rolls had less moisture content (by 14.3%) from 84.24 to 69.945%. DRI values wasn't calculated since this is not the only source of moisture (water from food only) and patient allowed to drink water freely all the time.

Turkey is a kind of poultry products; therefore, it is rich in protein and fat while being poor in fibers and carbohydrates. Processing the new product resulted in the increase of fibers and carbohydrates and decrease of fat and protein. Ash was also increased. It should be noted that the aim of processing new foods was to have products that may help depression patients.

The new formulated turkey rolls showed better sensory characterizations, indicating that the new formula was of better eating quality than the control sample **Table (20)**.

Table (13): Chemical composition of turkey samples

Chemical composition (g/150g product)	Control			Suggested new formula						
	Content	Male (19-30 years)	Female (19-30 years)	Content	Male (19-30 years)			Female (19-30 years)		
		% of DRI	% of DRI		% of control	DRI	% of DRI	% of control	DRI	% of DRI
Moisture (g/150g)	84.24			69.945						
Fat (g/150g)	21.95	24.83	36.79	8.22	37.445	88.4	9.29	37.445	67.5	12.17
Ash (g/150g)	1.68			7.635	454.40			454.40		
Crude fiber (g/150g)	0.77	2.03	8.15	3.225	416.11	38	8.48	416.11	25	12.9
Crude protein (g/150g)	26.73	47.73	103.76	23.16	86.64	56	41.35	86.64	46	50.34
Total carbohydrates (g/150g)	14.42	2.66	0.65	37.8	262.13	540.5	6.99	262.13	410.4	9.21
Total Calories (kcal)	362.1	11.379	0.46	317.01	87.54	3181.98	9.96	87.54	2433.03	13.02

Data of **Tables (14 & 15)** show the FA composition of control and suggested new formula for patients with depression. As reported by **Larrieu *et al.*, (2018)** PUFAs have received substantial attention for being relevant to many brain diseases including anxiety and depression. The main PUFAs in the brain are docosahexaenoic acid docosahexaenoic acid and docosatetraenoic acid both derived from omega-6 FA, linoleic acid **(Sinclair *et al.*, 2007)**. Levels of omega-3 PUFAs have been found to be depleted in people with major depression in the acute stage (**Jadoon *et al.*, 2012; Liu *et al.*, 2013 & Morgese *et al.*, 2017)**.

From results of **Table (14)** it is evident that UFA in new formulated turkey rolls was higher (71.02%) than that of the control (68.79%), SFA was less in new product (28.95%) compared with that of control (30.12%). Omega-9 FA was also higher for the new product (28.62%) than control (23.76%). Nowadays, the studies are carrying out to find out and prove the importance of omega-9 FA for the health of people. USFA/SFA was more (2.45%) of the new product in comparison with that of control (2.28%). These levels indicted that newly formulated turkey rolls fat was better (being of more unsaturation) than the control sample. This was confirmed by the results of EFA content (n-3) **Table (15)**. n-3 FA was higher for new rolls compared with control (4.5 & 1.07g) respectively. **Wells (2018),** showed the benefit for using omega-3 and fish oil in the treatment of a variety of depressive disorders. C18:3 was more (4.5g) in the new product compared with control (1.07g).

Table (14): Fatty acid profile of turkey samples

Fatty acid profile (%)	Control	Suggested new formula	
	Content	Content	% of control
Butyric acid (C4:0)	0.002	0.11	
Caproic acid (C6:0)		0.23	
Cprylic (C8:0)	2.53	0.13	5.13
Cpric (C10:0)	0.08	0.28	350
Lauric (C12:0)	0.01	0.43	4300
Myristic (C14:0)	3.36	1.74	51.78
Myristoleic (C14:1)	0.01	0.1	1000
Pentadecanoic (C15:0)	0.01	0.21	2100
Pentadecenoic (C15:1)		0.05	
Palmitic (C16:0)	14.64	19.65	134.22
Palmitoleic (C16:1)	0.14	0.74	528.57
Heptadecanoic (C17:0)	0.05	0.27	540
Heptadecenoic (C17:1)	0.01	0.08	800
Stearic (C18:0)	6.64	5.3	79.81
Oleic (C18:1)	23.34	27.52	117.91
Linoleic (C18:2)	43.96	37.7	85.76
Linolenic (C18:3)	1.07	4.5	420.56
Stearidonic acid (C18:4)		0.15	
Arachidic (C20:0)	1.76	0.32	18.18
Gadoleic (C20:1)	0.26	0.18	69.23
Behenic (C22:0)	1.04	0.28	26.92
UFA (unsaturated fatty acids)	**68.79**	**71.02**	103.24
SFA (saturated fatty	**30.122**	**28.95**	96.1

acids)			
Omega-3	**1.07**	**4.5**	420.56
Omega-6	**43.96**	**37.7**	85.76
Omega-9	**23.76**	**28.62**	120.45
MUFA (mono unsaturated fatty acid)	**23.76**	**28.62**	120.45
PUFA (poly unsaturated fatty acid)	**45.03**	**42.35**	94.03
Unsaturated/saturated	**2.28**	**2.45**	107.45
P/S (poly unsaturated/ saturated)	**1.49**	**1.46**	97.98

Table (15): Evaluation of EFA of turkey samples

EFA (%)	**Control**			**Suggested new formula**						
	Content	**Male (19-30 years)**	**Female (19-30 years)**	**Content**	**Male (19-30 years)**			**Female (19-30 years)**		
		% of DRI	**% of DRI**		**% of control**	**DRI**	**% of DRI**	**% of control**	**DRI**	**% of DRI**
n-6	9.67	69.07	87.9	56.55	584.79	14	403.92	584.49	11	514.09
n-3	1.23	76.87	111.81	6.75	548.78	1.6	421.87	548.78	1.1	613.63

EAA profile of turkey rolls **Table (16)** show the tryptophan level of control and new formula of turkey rolls. As reported by **Lindseth *et al.*, (2015),** increasing up tryptophan may affect depression and mood scores of healthy participants reflecting in less depressive symptoms and better mood states when more tryptophan was present in their diet. Availability of tryptophan can represent a key element for both mood and cognitive functioning, because of its role as a precursor for production of neurotransmitter serotonin. It is generally recommended that healthy adults consume around 5mg/kg body weight per day of L-tryptophan **(Strasser *et al.*, 2016)**. Data of **Table (16)** revealed that processing of new turkey rolls raised the tryptophan level from 1.21mg/100g protein to 4.14mg/100g protein. This reveals an amount of tryptophan of 0.32mg/100g control rolls and 0.95g in new formula. Thereby while control formula did give more than 0.315mg tryptophan, the new formula resulted in 0.959g, i.e. more than 0.315g, precisely three times of the required amount of tryptophan.

The new turkey sample was of higher nutritional value as indicated by levels of $PER_{1,2}$ and $B.V_{1,2}$.

Table (16): Essential amino acid profile (EAA) of turkey samples

Amino acid profile (g/100gm protein) Essential amino acids:	Control		Suggested new formula			
	Content	% of DRI	Content	% of control	DRI	% of DRI
Tryptophan	1.21	**172.85**	4.14	**342.14**	0.7	**591.42**
Threonine	4.24	**157.03**	4.87	**114.85**	2.7	**180.37**
Isoleucine	4.68	**187.2**	4.125	**88.14**	2.5	**165**
Leucine	7.96	**.72**	9.27	**116.45**	5.5	**168.54**
Lysine	8.69	**170.39**	19.04	**219.1**	5.1	**373.33**
Valine	4.99	**155.93**	4.97	**99.59**	3.2	**155.31**
Histidine	3.46	**192.22**	6.12	**176.87**	1.8	**340**
Methionine + Cysteine	**3.61**	**144.4**	**5.36**	**148.47**	2.5	**214.4**
Phenylalanine + Tyrosine	**9.02**	**191.91**	**8.67**	**96.11**	4.7	**184.46**
PER1	**2.57**		**3.36**			
PER2	**2.32**		**3.34**			
BV1%	**76.24**		**84.51**			
BV2%	**73.59**		**84.28**			

Table (17): Sensory evaluation of control and suggested new formulation for cake samples

Groups	Aroma Mean ± SD	Taste Mean ± SD	Color Mean ± SD	Texture Mean ± SD	Overall acceptability Mean ± SD
Control	8.35^{a} ±0.671	7.8^{b} ±0.768	8.1^{b} ±0.718	7.9^{b} ±0.641	8.06^{b} ±0.343
Suggested formulation	8.55^{a} ±0.51	8.1^{a} ±0.81	8.65^{a}±0.489	8.75^{a}±0.55	8.63^{a} ±0.425
LSD	0.382	0.464	0.393	0.382	0.247

*Mean under the same column bearing different superscript letters are different significantly ($p<0.05$).

Table (18): Sensory evaluation of control and suggested new formulation for cookies samples

Groups	Aroma Mean ± SD	Taste Mean ± SD	Color Mean ± SD	Texture Mean ± SD	Overall acceptability Mean ± SD
Control	8.2^{b} ±0.616	7.3^{b} ±0.571	7.95^{b} ±0.51	8.15^{b} ±0.745	7.91^{b} ±0.317
Suggested formulation	8.85^{a} ±0.366	8.8^{a} ±0.41	8.65^{a}±0.671	8.75^{a}±0.444	8.75^{a} ±0.380
LSD	0.324	0.318	0.382	0.393	0.224

*Mean under the same column bearing different superscript letters are different significantly ($p<0.05$).

Table (19): Sensory evaluation of control and suggested new formulation for buttermilk samples

Groups	Aroma Mean ± SD	Taste Mean ± SD	Color Mean ± SD	Texture Mean ± SD	Overall acceptability Mean ± SD
Control	8.05^{b} ±0.826	7.8^{b} ±0.834	8.25^{b} ±0.716	7.95^{b} ±0.605	8.01^{b} ±0.425
Suggested formulation	8.85^{a} ±0.366	8.75^{a} ±0.444	8.85^{a}±0.366	8.8^{a}±0.523	8.81^{a} ±0.280
LSD	0.409	0.428	0.364	0.362	0.230

*Mean under the same column bearing different superscript letters are different significantly ($p<0.05$).

Table (20): Sensory evaluation of control and suggested new formulation for poultry samples

Groups	Aroma Mean ± SD	Taste Mean ± SD	Color Mean ± SD	Texture Mean ± SD	Overall acceptability Mean ± SD
Control	8.1^{b} ±0.641	7.25^{b} ±0.444	7.95^{b} ±0.394	8.2^{b} ±0.523	7.88^{b} ±0.207
Suggested formulation	8.9^{a} ±0.308	8.8^{a} ±0.410	9^{a}±0.0	8.95^{a}±0.824	8.91^{a} ±0.147
LSD	0.322	0.274	0.178	0.258	0.115

*Mean under the same column bearing different superscript letters are different significantly ($p<0.05$).

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تواليفات غذائية مقترحة غنية ببعض العناصر الغذائية الضرورية للوقاية من الإصابة بالإضطراب الإكتئابي الرئيسي

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الملخص العربي :

يعد الاضطراب الاكتئابي الرئيسئ (MDD) حالة شائعة ومزمنة تفرض عبئًا كبيرًا من الإعاقة على مستوى العالم. وبما أن العلاجات الحالية تشير إلى أنها تعالج ثلث العبء المرضي فقط للاضطرابات الاكتئابية، وبما أن غالبية مرضى الاكتئاب لا يبحثون عن العلاج، فقد ظهرت الحاجة إلى أساليب جديدة للوقاية من الاكتئاب أو تأخير تقدمه وتخفيف أعراضه. لذا تهدف هذه الدراسة إلى تحضير بعض التوليفات الصحية التي تساعد في علاج الاكتئاب. أظهرت نتائج هذه الدراسة زيادة معنوية في محتوى التربتوفان لجميع التوليفات المقترحة عند مقارنتها بالعينات الكنترول. علاوة على ذلك، كشفت عينات الكيكة والكوكيز المصنعة حديثا عن زيادة في البروتين والألياف والدهون. بينما انخفضت الكربوهيدرات في عينة الكيك ولم يتأثر محتواها في عينة الكوكيز. وفي توليفة اللبن الرايب، زادت نسبة البروتين والألياف بشكل ملحوظ، بينما انخفضت السعرات الحرارية والدهون، مما يجعله منتج صحي أكثر من العينة الكنترول. أما بالنسبة للفائف الديك الرومي، فقد احتوت التركيبة على المزيد من الألياف والكربوهيدرات ونسبة أقل من البروتين والدهون. أخيرًا، أظهرت عينات الكيك والكوكيز واللبن الرايب المقترحة زيادة كبيرة في محتوى PUFA (n-3 وn-6)، وقيم UFA/SFA وP/S، في حين أظهرت هذه التوليفات انخفاض في محتوى SFA و(n-9) MUFA ، باستثناء توليفة اللبن الرايب أظهرت أيضًا زيادة كبيرة في MUFA. كشفت عينة لفائف الديك الرومي عن زيادة في PUFA n-3 وMUFA n-9 وقيمة أعلى لـ UFA/SFA ولكن أظهرت انخفاضًا في n-6 PUFA، ونتيجة لذلك أظهرت قيمة أقل لـ P/S. توصي الدراسة بإدراج المنتجات الجديدة المقترحة في النظام الغذائي اليومي للمرضى الذين يعانون من الإضطراب الإكتئابي الرئيسي.

الكلمات المفتاحية: الاكتئاب – أوميجا 3 – التربتوفان – الأحماض الأمينية – التوليفات الغذائية – دقيق الموز – دقيق الصويا – التقييم الحسي.