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BREAD PRODUCED FROM COMPOSITE WHEAT FLOUR WITH WHEAT BRAN AND OLIVE LEAF POWDER FOR REDUCING THE SERUM GLUCOSE IN DIABETIC RATS

A.M. M. Abd El -Hafez
High Institute for Tourism & Hotel, 6 October City, Egypt

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ABSTRACT: *The current study aims to evaluate the significance substitution of wheat flour 80% extraction WF with olives leaves powder OLP and wheat bran WB as an antioxidant on reducing blood glucose for diabetic rats. The suggested healthy bread blends were prepared by substitution of the WF with WB and OLP by the ratio of 10 and 15% (Blend A), 15 and 10% (Blend B) and 20 and 5% (Blend C), respectively. The chemical analysis of the used materials showed the highest total phenolic and total flavonoids contents in OLP were 37mg/g and 1350 µg/g followed by WB, 4.66 mg/g and 205.56 µg/g and WF were 2.57.mg/g and 208.02 µg/g, respectively. Rheological analysis indicated that there was a gradual increase in water absorption, dough development time, weakening and mixing tolerance index with increasing OLP and WB in the bread samples. Also, the adding of OLP and WB to WF lead to decrease extensibility, resistance to extension ratio (R/E) and energy parameters. Chemical analyses showed that an increase in moisture, fat, crude fiber, ash by the ratio of 22.97, 24.65, 81.58 and 63.08%, respectively, and decrease in the contents of protein and carbohydrate by the ratio of 16.97 and 19.67% , respectively in the suggested bread samples compared with the control bread. The sensory evaluation showed that there was no significant difference observed between the control bread and the suggested bread samples in the parameters attributes of crust colour and crumb appearance, while significant difference ($p<0.05$) was observed in texture, flavor and overall acceptability. A marked decline in levels of blood glucose was observed when such suggested bread samples used in feeding the diabetic rats.*

Key words: *Whole wheat flour, olive leaves powder, wheat bran, proximate analysis, diabetes, bread, antioxidant, rheological properties, biological properties, chemical properties and sensory properties.*

INTRODUCTION

In the last 50 years science has provided new perspectives on the ancient art of herbal medicine. The evidence base for phytotherapy is small and lags behind that for the nutritional sciences, mainly because phytochemicals are ingested as complex mixtures that are incompletely characterized and have only relatively recently been subject to scientific scrutiny Walker (2006). One of these plants is olive leaves which have high potential for industrial exploitation in the food industry due to its high phenolic content Erbay and Icier (2009), the main process in olive leaf treatment is drying Erbay and Icer (2011). Dried olive leaves are known for it is therapeutic and antioxidant properties, (Bahloul, *et al*., 2009). Olive tree (*Olea europaea*, *Oleaceae*) is a ligneous plant, anciently known in the Mediterranean basin (Melillo, 1994). The olive tree has been widely accepted as one of the species with the highest antioxidant activity via its oil, fruits, and leaves. It is well known that the activity of the olive tree byproduct extracts in medicine and food industry is due to the presence of some important antioxidant and phenolic components to prevent oxidative degradations. Olive leaves are considered a cheap raw material and a useful source of high-added value products (Briante, *et al*., 2002). The main phenolic compound in olive leaves is the glycosylated form of oleuropein (Amro, *et al*., 2002 and Visioli, *et al*., 2002). It is natural phenolic antioxidant, which is present in high concentration in olives, olive oil and olive tree leaves (Andreadou, *et al*., 2007). Meanwhile olive tree (*Olea europaea L*.) leaves have been widely used in traditional remedies in European and Mediterranean countries such as Greece, Spain, Italy, France, Turkey, Morocco, and Tunisia (Pinelli, *et al*., 2000). On the other hand used in the human diet as an extract, an herbal tea, and a powder, and they contain many potentially bioactive compounds that may have antioxidant El-Sedef and Karakaya (2009). The various phenolic compounds, such as secoiridoids and flavonoids, that are expected to exert strong antioxidant capacity, that as a result to occur during maturation of olive leaves, which could explain changes observed in antioxidant capacity: (1) bioconversion of oleuropein and ligstroside into verbascoside isomers and oleuroside, and (2) bioconversion of flavonoid aglycones into glucosylated forms of luteolin (Laguerre, 2009). Meanwhile (Coban, *et al*., 2014)) showed that olive leaf Possesses antioxidant properties, while (Lee, *et al*., 2009) proved that it contains significant amounts of oleuropein and phenolics, important factors for antioxidant capacity, which can be substantially modified by different extraction methods. In addition to the foregoing olive leaves also expansion human hematopoietic stem and progenitor cells (Samet, *et al*., 2014), anti-inflammatory (Gong, *et al*., 2012), hypoglycemic, (Zaynab, *et al.,* 2015 and Derraik, *et al*., 2013), antimicrobial and antiviral properties (Goulas, *et al*, 2013). antitumoral (Grawish, *et al*., 2011), also well-known for its, cardioprotective hypocholosterolemic and hepatoprotective (Poudyal, *et al.*, 2010).The effects of OLP on glucose homeostasis in human supplementation with it for 12 weeks significantly improved insulin sensitivity and pancreatic beta -cell secretory capacity in overweight middle-aged men at risk of developing the metabolic syndrome, (Bock, *et*, *al.,* 2013). On the other hand oleuropein may be of advantage in inhibiting hyperglycemia and oxidative stress induced by diabetes and suggest that administration of oleuropein may be helpful in the prevention of diabetic complications associated with oxidative stress, (Al-Azzawie, *et al.,* 2006). In addition to the foregoing it is recognized as a folk medicine for diabetes in Europe and it is suppressed the elevation of blood glucose after oral administration of starch in borderline volunteers (fasting blood glucose: 110-140 mg/dl), and thus they may be a useful food supplement for the prevention of diabetes (Komaki, *et al*., 2003). Olive leaves nutrient levels analysis were 94, 18, 88, 18 and 18 mg/100g for N, P, K, Mg and Ca and (88, 6, 52, 45 and 21 mg/100g) for Fe, Mn, Zn, Cu and B, respectively (El-Fouly, *et al.,* 2005). Fiber from whole wheat reduced human risk with high intakes of cereal fiber or mixtures of whole grains and bran (foods with ≥25% bran), (Cho, *et al*., 2013), whereas whole grains contain a myriad of functional components that work both alone and in combination with benefit overall health and reduce the risk of disease, Jones (2008). Also this grain contains numerous other components that may play role in health and disease risk reduction, such as polyphenols, carotenoids, vitamin E and phytosterols. The additive and synergistic effects of these compounds may contribute to the health benefits of whole grain consumption. The study of Dalton, *et al*., 2012 provides an overview of the major components in whole grain wheat and reviews their associated health benefits. With increased awareness of a healthy lifestyle based on consumption of functional foods, breads containing whole grain, multi-grain or other functional ingredients especially from rich sources will increasingly become more important in the bakery industry and in the emerging market (Dewettinck, 2008).

For all of these reasons, the present study aims to produce bread from composite WF with WB and OLP blends for reducing the serum glucose in diabetic rats. Also, chemical, rheological and sensory evaluation of these bread samples will be in the scope of this investigation.

MATERIALS AND METHODS

I. Materials:

1. Commercial wheat cultivar from Egyptian markets in 2015 season.
2. Bran fraction type Geiza-9. Originating from Wheat Technology Department, Agriculture Research Centre, Giza, Egypt.
3. Olive Leaves type (Ajizy Shami kind) obtained from El-Fayoum governorate. Collected at April 2015.
4. All chemicals were purchased from the Republic Chemical Company and medicines.

II. Methods:

1. Samples preparation:

Fresh olive leaves after collecting were washed and dried according the method obtained by Erbay and Icer (2010), after that stilled to cool at room temperature, leaves was grinded by electric machine type, (Toshiba El-Araby, Benha, Egypt),even become fine powder sieved through sifter 40 mesh and kept in polyethylene pages until analysis experiment.

2. Chemical analysis

2.1. Determination of the chemical composition:

The chemical composition (moisture, proteins, lipids, crude fiber, ash and total carbohydrates) were determined according to AOAC (2005) methods. Available carbohydrate was determined by difference according to Onwuka (2005).

2.2. Determination of total phenolic compounds

The total phenol contents in the wheat flour, whole wheat flour and olive leaves powder were estimated according to (Yu, *et al*., 2003) method.

2.3. Determination of total flavonoids content

Flavonoid contents of wheat flour, whole wheat flour and olive leaves powder were determined by using the aluminum chloride colorimetric according to Chang *et al*. (2002) method.

3. Rheological properties

Rheological properties were evaluated in Bisco-Misr Company laboratory using Barabender Farinograph and extensograph according to AACC (2000).

4. Healthy bread baking:

Different blends were mixed at the quantatity of (750g) blended wheat flour with (82%) extraction, (15g) active dry yeast, sodium chloride (15 g) as a control one. The other blends by substitution [100 g (OLP) and 150 g (WB)] sample A, [150 g(OLP) and 100gm (WB)] sample B, or [200 g (OLP) and 50g (WB) sample C, olive leaf powder and wheat bran from wheat flour respectively healthy bread was prepared by straight dough method according to the method described by Finney (1984).

The baked breads were cooled down at room temperature for two hours and were then sliced and wrapped up in polystyrene bags. The samples were stored in airtight containers and kept in a refrigerator (7ºC) till used.

5. Determination of physical properties

The bread characteristics, such as (the dough expansion, bread volume and bread specific volume) were measured by the method of Maneju *et al*. (2011).

6. Sensory Evaluation of the Baked Product

Sensory properties of bread loaves were evaluated by ten panelists. Their preference of the samples was evaluated using the 9-point hedonic scale for 1- extremely dislike and 9- like extremely according to the method of (Ihekoronye and Ngoddy, 1985). The bread samples were evaluated for (crust color, crumb texture, taste and overall acceptability). During sensory evaluation, panelists were instructed to drink water or rinse their mouths to clear the palate after each evaluation. Sensory evaluation was done on the same day of bread preparation.

7. Biological experiments

7.1. Animals

Twenty four male Sprague Dawley rats weighing 140-160g were obtained from the animal facility of the National Research Center (Giza, Egypt).

7.2. Basal Diet:

The basic diet was prepared according to the following formula as mentioned by (AIN, 1993) as follow: protein (10%), corn oil (10%), vitamin mixture (1%), mineral mixture (4%), choline chloride (0.2%), methionine (0.3%), cellulose (5%), and the remained is corn starch (69.5%). The used vitamin mixture component was that recommended by Campbell ,(1963) while the salt mixture used was formulated according to Hegsted, (1941).

7.3. Experimental design

Rats were housed individually in wire cages in a room maintained at 25 ± 2 °c and kept under normal healthy conditions. All rats were fed on basal diet for one-week before starting the experiment for acclimatization. After one week period, the rats were divided into two main groups, the first group (Group 1, 4 rats) still fed on basal diet and the other main group (20 rats) was injected subcutaneous by alloxan monohydrate to induce diabetic rats then classified into sex sub groups as follow:

- Group (2): Fed on standard diet only as a positive control (rats with diabetes).
- Group (3): Fed on standard diet containing 10% bread without plant parts.
- Group (4): Fed on standard diet containing 10% bread (Sample A)
- Group (5): Fed on standard diet containing 10% bread (Sample B)
- Group (6): Fed on standard diet containing 10% bread (Sample C)

7.4. Induction of diabetes:

Diabetes was induced in twenty normal healthy rats by injection into operationally with freshly prepared alloxan monohydrate in saline at a dose level of 150 mg/ kg body weight . Immediately after injection animals were received 5% glucose solution over night to overcome drug induced hypoglycemia *(Wohaeb andGodin, 1987* and *Kakkar et al., 1997).* After five days blood glucose was analyzed by a drop of blood was obtained from tail vein and subjected to a strip of haemogluco test. All rats with fasting blood sugar > 126 mg\dl were considered to be diabetics and included in the experiment.

8. Statistical analysis

The obtained results were evaluated statistically using analysis of variance as reported by McClave and Benson (1991). In addition the other reported values were expressed as mean ± SD, two – tailed Student's *t* test was used to compare between different groups. *P* value less than

0.05 was considered statistically significant. SPSS (Chicago, IL, USA) software window Version 16 was used.

RESULTS AND DISCUSSION

1. Total content of phenolics and total Flavonoids.

Table (1) illustrates the total phenolic(mg /g) and flavonoids (µg/g) in OLP, WF and WB. Results showed that the highest total phenolic content was found in OLP, results were harmony to (Bahloul *et, al.,*2009) followed by WB and the lowest content was found in WF. Erbay and Icier (2009) reported that the interest in olive leaf has increased due to its high phenolic content. The dried leaves have a high potential for industrial exploitation in food industry and thus the main process in olive leaf treatment is drying which affected the product quality and usability . From the same table it is clear that OLP was the highest in total flavonoids when compared with other ingrediants followed by WF and WB respectively. These results are in agreement with that obtained by Boudhrioua *et al.,* (2009), Erbay and Icer. (2010) and Zaynab *et al.,* (2015). Also, Vaher *et al.,* (2010) they found that the bran layers have the highest content of total phenolics content, when stated that the phenolic compounds and the antioxidant activity of the bran, flour and whole grain of different wheat varieties.

2. Approximate analyses of raw materials and bread samples.

Table (2) summarizes the average analysis of raw materials moisture, protein, fat, crude fiber and ash of the (WF) and it is substitutes by WB and OLP. Results showed increase in protein, moisture and total carbohydrate levels of WF compared to WB and OLP. However, fiber recorded highest content in WB followed by OLP followed by WF. Also fat increased in WB followed by WF followed by (OLP) they were (4.3, 3.6 and 2.10%) respectively.

As shown in table (3) the loaves samples from WF and their blends with OLP and WB were analyzed. Results exhibited an significant increase at ($P<0.05$) in protein ratio it was (8.13%) in control sample, this ratio decreased with increasing substitution levels compared to WF blends with OLP and WB] there were (8.00, 7.85 and 7.75%) in samples (A, B and C) respectively. Also significant increased at ($P<0.05$) in total carbohydrate content from (84.48%) in control to (67.86, 68.08 and 68.96%) in samples (A, B and C) respectively. Meanwhile total moisture, fat, fiber and ash levels showed significant decreased at ($P<0.05$) in WF bread sample compared with to [WF blends with OLP and WB] bread samples. As reported by Salehifar and Shahed (2007), and Pastuszka *et al*. (2012).

Table (1): Total phenols content (mg/g) and total flavonoid contents (µg/g) of OLP, WF , and WB.

Sample	Total phenol mg mg /g	Total Flavonoids (µg/g)
POL	37.00	1350
WF	2.57	208.02
WB	4.66	205.56

*Each value was an average of three replicate.

Table (2): Approximate analyses of WF, OLP and WB samples.

Samples	Moisture (%)	Protein (%)	Fat (%)	Fiber (%)	Ash (%)	Total carbohydrates (%)
(WWM)	13.0	13.9	3.6	4.5	1.65	76.35
(WB)	9.9	11.2	4.3	42.8	5.80	35.9
(OLP)	3.78	7.90	2.10	19.1	4.9	66.0

Table (3): Approximate analyses of bread samples.

Samples	Moisture (%)	Protein (%)	Fat (%)	Fiber (%)	Ash (%)	Total carbohydrates (%)
WF (Control)	18.50^{df}±0.17	8.13^{a}±0.13	2.20^{d}±0.07	3.30^{d}±0.13	1.89^{c}±0.001	84.48^{a}±0.65
Sample A	18.90^{c}±0.11	8.00^{b}±0.12	2.92^{a}±0.05	17.92^{a}±0.15	3.30^{b}±0.003	67.86^{d}±0.56
Sample B	19.20^{b}±0.09	7.85^{c}±0.09	2.77^{b} ±0.06	16.71^{b}±0.11	4.59^{ab}±0.002	68.08^{c}±0.60
Sample C	20.00^{a}±0.07	7.75^{d}±0.11	2.67^{c}±0.02	15.50^{c}±0.12	5.12^{a}±0.001	68.96^{b}±0.45
LSD	0.082	0.092	0.087	0.75	0.059	0.52

*At P<0.05

3. Rheological properties.

3.1. Farinograph parameters

As shown in table (4), water absorption increased as WB and OLP levels increased. It's due to the high fiber content of WB and OLP. Fiber is characterized by its high water holding capacity as reported by Hussein *et al*., (2012) and Abou-Zaid *et al*., (2014). Stronger wheat flours have the ability to absorb and retain more water as compared to weak flours (Mis, 2005). Also water absorption is affected by the protein content of the flour (Finney, *et al*., 1987). In this study, as the WB and OLP levels in the flour increased, the time needed for the preparation of a good dough was also increased, due to dilute gluten net work Abou-Zaid *et al*., (2012). However, the inclusion of a higher amount of bran in the dough formulation usually resulted in increased dough water absorption due to the higher levels of pentosans present in bran (Sanz-Penella, *et al*., 2008). Dough stability indicates the time when the dough maintains maximum consistency and is a good indication of dough strength. Good quality dough has stability of 4–12 min (Kulhomaki and Salovaara, 1985). Dough stability time decreased by increased amount of WF additive as WB and OLP . Such changes mainly can be explained with the decreasing of gluten content in the analyzed WF samples . Dough mixing and formation. The stability time is an indication of the strength of flour, a higher value signifying stronger dough. Similar results were obtained by also, the increased dough development time of dough samples with WF and substituted flours, comparing with control flour sample mainly can be due to differences in a chemical composition of whole flour, and its elevated dietary fiber content especially (Zhang, *et al*., 2014). On the other hand, dough weakening and mixing tolerance index were increased by adding WB and OLP to whole wheat flour at all substitute levels . These results are in harmony with those obtained by Sudha *et al* (2007).

Table (4): Farinograph parameters of dough prepared from different blends.

Samples	Water absorption (%)	Arrival time (min)	Dough development time(min)	Stability time (min)	Weakening (BU)	Mixing tolerance index (BU)
WF (control)	72.5	2.0	5.5	18.0	50	30
Sample A	66.0	1.5	4.0	10.0	90	45
Sample B	68.5	1.5	4.5	8.0	110	60
Sample C	71.5	1.0	5.0	6.0	140	80

3.2. Extensograph properties

Table (5) show the effect of composite WF with WB and OLP. on the dough's extensograph parameters. Extensibility, resistance to extension, proportion number, and energy were decreased by OLP and WB increasing in the blend.That effect was related to the presence of fiber in WB than OLP and WF that dilutes gluten content in dough Abou-Zaid *et al*., (2012). Viscoelastic properties of wheat doughs depend on gluten quality and quantity. So, as gluten content increases viscoelastic properties are improved. This decrement may be due to the deficiency of gliadin and glutenin in WB followed by OLP flours. Lapvetelainen *et al*. (1994) reported that dough extensibility and resistance measured with an extensograph decreased following the addition of 3 and 6% of high-protein oat flour to wheat flour. Gliadins and glutenins are the two primary types of grain protein which are responsible for the elastic and viscous properties, respectively, which help to form a continuous spatial network in the dough Salwa *et al.* (2014).

4. Biological studies.

Data in table (6) indicated the effect of bread produced from composite whole wheat flour with WB and OLP on blood glucose level in diabetic rats. Form such data it could be noticed that group induction with alloxane increased the serum blood levels by the rate of 117.73% as compared with the control samples. Feeding with bread samples A, B and C lead to statistically decreased in serum glucose by the rate of 19.86, 12.77 and 3.55%, respectively, as compared to the untreated diabetic group. Substitution of OLP and WB significantly decreased the levels of serum glucose in normal rats. Bock *et al.,* (2013) reported that the oleuropein and tannins in olive leaves act as α-glucosidase inhibitors, reducing the absorption of carbohydrates in the gut, since oleuropein is a glycoside, it could potentially access a glucose transporter such as a sodium-dependent glucose transporter found in the epithelial cells of the small intestine, thereby permitting its entry into the cells. Moreover, the extract of olive leaves was shown to have an inhibitory effect on the postprandial blood increase in glucose in diabetic rats (Komaki *et al.,* 2003). There have been two possible mechanisms suggested to explain the hypoglycemic effect of the OLP : (1) oleuropein improved glucose-induced insulin release, and (2) increased peripheral uptake of glucose (El Sedef and Karakaya, 2009). Consumption of wheat fiber resulted in a significant decrease of systolic and diastolic blood pressure and glucose,. Premakumari and Haripriya, (2007). The oleuropein in olive leaves has been shown to accelerate the cellular uptake of glucose, leading to reduced blood glucose (Cvjeticanin *et al*., 2010). Another way in which olive leaves extract might exert its hypoglycemic effect is through the inhibition of pancreatic amylase activity (Komaki *et al*., 2003). While Cho *et al*., (2013) reported that consumption of foods rich in cereal fiber or mixtures of whole grains and bran is modestly associated with a reduced risk of obesity, type 2 diabetes (T2DM). and increase the production of beneficial compounds such as short-chain fatty acids. However, in addition to the effects of fiber, wheat contains numerous other components that may play a role in health and disease risk reduction, such as polphenols, carotenoids, vitamin E, and phytosterols. The additive and synergistic effects of these compounds may contribute to the health benefits of whole grain consumption Dalton *et al.,* (2012).

5. Physical characteristics of produced loaves.

Results of the physical characteristics of composite bread samples containing different levels of WB and OLP replaced as compared to the control is also shown in Table (7). The bread loaf expansion and loaf volume decreased in range of (6.25 to 13.04%), and (9.65 to 41.93%), respectively, as the level of replaced by WB and OLP flours increased. Gomez *et al*. (2003) reported that, the main problem of dietary fiber addition in baking is the important reduction of loaf volume and the different texture of the obtained breads. This result was strengthened by (Islam *et al*., 2007). Dietary fiber additions, in general, had pronounced effects on dough properties yielding higher water absorption, mixing tolerance and tenacity, and smaller extensibility in comparison with those obtained without fiber addition (Elleuch, *et al*., 2011). The deleterious effects of addition of fiber on dough structure and loaf volume have been suggested to be due to the dilution of gluten network, which in turn impairs gas retention rather than gas production (Dewettinck, *et al*., 2008).

6. Sensory characteristics

Results of sensory evaluation of bread samples under this study were shown in Table (8). The results of bread crust color and crumb structure did not show a consistent pattern for all the bread samples, and there was no significant difference in the bread samples compared to control sample. The darker color of the crumbs of whole wheat bread and replaced breads reported by several authors (Serrem, *et al*., 2011). The brownish bread appearance could be directly related to the increase in fiber content (Hu, *et al*., 2007). The scores for texture of bread samples, increased by WBand OLP increasing in the blend. Loaves of sample (A) had the best texture score.

Table (5): Extensograph parameters of dough prepared from different blends.

Samples	Extensibility (E,mm)	Resistance to Extension (R,BU)	Ratio (R/E)	Energy (cm^2)
WF (control)	140	580	4.14	85
Sample A	110	500	4.5	78
Sample B	90	320	3.56	65
Sample C	70	240	3.43	50

Table (6): Effect of bread produced from composite WF with WB and OLP on blood glucose level in diabetic rats

Parameters	Blood glucose level (mmol/ l)	Percent of change (%)
Group 1 (Control negative)	14.1±0.12 ^{d}	-----
Group 2 (Control positive, diabetic)	30.7 ±3.9 ^{a}	117.73
Group 3 (Diabetic-Control bread)	29.8 ±1.2 ^{a}	111.35
Group 3 (Diabetic-bread sample A)	16.9 ±1.2 ^{b}	19.86
Group 3 (Diabetic-bread sample B)	15.9 ±1.2 ^{b}	12.77
Group 3 (Diabetic-bread sample C)	14.6 ±1.5 ^{c}	3.55

Values with the different superscript letters on the same column means significantly different at p<0.05

Table (7). physical characteristics of bread loavies samples.

Parameters	Bread samples			
	WF (control)	Sample A	Sample B	Sample C
Bread volume (cm^3)	310^{a} ±0.25	280^{b} ±0.35	210^{c} ±0.30	180^{d} ±0.25
Dough expansion (cm)	460^{a} ±0.20	430^{b} ±0.30	405^{c} ±0.25	400^{d} ±0.35
Specific volume (cm^3/g)	0.78^{a} ±0.10	0.70^{b} ±0.20	0.53^{c} ±0.15	0.45^{d} ±0.10

*Data are mean values of triplicate determination ± standard deviation

Table (8): Sensory scores of bread samples.

Parameters	Bread samples			
	control	Sample A	Sample B	Sample C
Crust color	4.6^{a}	4.7^{a}	4.7^{a}	4.3^{a}
Crumb structure	4.7^{a}	4.4^{a}	4.1^{a}	4.0^{a}
Texture	5.0^{ab}	4.7^{bc}	5.2^{a}	4.8^{b}
Flavour	4.2^{a}	4.1^{a}	3.8^{b}	2.0^{c}
Overall acceptability	4.2^{a}	3.9^{b}	3.8^{b}	3.6^{bc}

*Means within a row with different letters are significantly different at P≤ 0.05

Hard crumb texture due to increased fiber from wheat bran and olive leaf powder as reported by Eiman *et al*. (2008) aqbout the effect of wheat bran. The baking conditions (temperature and time variables); the state of the bread components, such as fibres, starch, protein (gluten) weather damaged or undamaged and the amounts of absorbed water during dough mixing, all contribute to the final texture of the breads (Akhtar, *et al*., 2008). The incorporation of WB and OLP into whole-wheat bread led to lower flavor scores than control sample. The results showed to decrease in the scores as the whole-wheat flour was blended with WB and OLP. Sample (C) was recorded the lowest flavor scoure. Most of the panelist complained of light bitterness flavor and aroma from (C) sample bread. The sensory evaluation also revealed that breads contained WB and OLP were overall acceptable, even though normal bread (control) was still preferred. The baking properties of flour blends are often impaired as well as the organoleptic attributes of the products, due to the dilution of the gluten content as reported by (Dewettinck, *et al*., 2008). On the other hand different combinations of differnt flours contained high fiber content can be included in dough formulation to improve the baking and sensory quality of produced bread loaves (Lamaison, *et al*., 1990).

Conclusion

Data in results showed that the highest total phenolic and total flavonoid contents in olive leaf powder OLP and wheat bran WB , led to ameliorate hyperglycemia in diabetic rats. These findings provide a basis for used it and also have important implications for the prevention and early treatment of T2DM.Also this flours caused constancy in it is rheological properties, and sensory analysis of prepared healthy breads. The findings of this trial highlight the beneficial effect of olive leaf powder and wheat bran on human health.

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إنتاج خبز من خلط دقيق القمح مع الردة ومسحوق ورق الزيتون لخفض مستوى سكر الدم للفئران المصابة بالسكرى

عمرو عبد الحافظ محمد مرسى

المعهد العالى للسياحة والفنادق ٦ أكتوبر

الملخص العربى

تهدف الدراسة الحالية إلى تقييم أهمية إضافة مسحوق أوراق الزيتون الجافه ونخالة القمح بنسب محددة للحد من إرتفاع سكر الدم الناجم عن مرض السكري فى الفئران المصابة بداء السكرى عن طريق إحلال ٢٥% من دقيق القمح إستخلاص ٨٠% بمخلوط من (١٠٠ جرام مسحوق اوراق الزيتون+ ١٥٠جم رده القمح) عينة (أ) او (١٥٠جم مسحوق اوراق الزيتون + ١٠٠جم ردة قمح) عينة (ب) او (٢٠٠جم مسحوق اوراق الزيتون + ٥٠جم ردة قمح عينة (ج).

أظهرت نتائج التحاليل الكيميائية للخامات المستخدمة أعلى نسب للفينول الكلي (ملجم/جم) والفلافونويدات (ميكروجرام/غرام) لأوراق الزيتون المجفف (٣٧.٠٠ ملجم/جم و ١٣٥٠ ميكروجرام/جرام) يليها نخالة القمح (٤.٦٦ ملجم/جم و٢٠٥.٥٦ ميكروجرام/جرام) وأخيرا دقيق القمح ٨٠% إستخلاص (٢.٥٧. ملجرام/جم و٢٠٨.٠٢ ميكروجرام/جرام).

وأشارت نتائج التحاليل الريولوجية وجود زيادة تدريجية في نسب امتصاص الماء، و زمن تكوين العجين، ومعدل الإضعاف و قيمة الضعف مع زيادة نسب النخالة ومسحوق ورق الزيتون المجفف للدقيق المستخدم. ومن ناحية أخرى، إنخفاض زمن الوصول وفترة الثبات بزيادة نسب الإضافة. وكذلك انخفاض الرقم النسبى والطاقة والمرونة للعجين بزيادة نسبة الاضافة وأيضا ارتفاع نسبة مطاطية العجين بزيادة نفس نسب الإضافة.

التحاليل الكيمائية للخبز الناتج أوضحت زيادة نسبة الدهون والألياف الخام والرماد وأيضا انخفاض في البروتين والكربوهيدرات فى الخبز الناتج بزيادة نسبة اضافة النخالة ومسحوق أوراق الزيتون المجفف للدقيق المستخدم.

التحاليل البيولوجية على الجرذان المصابة بداء السكرى أظهرت إنخفاض فى نسب سكر الدم لتلك الجرذان.

بدراسة الصفات الطبيعية للخبز الناتج أظهرت النتائج انخفاض في الحجم والارتفاع مقارنة بالعينة الكنترول.

الصفات الحسية للخبز الناتج أظهرت إنخفاض معنوى فى جميع الصفات الحسية للخبز الناتج مقارن بالكنترول من حيث لون القصرة والمظهر والملمس والنكهة وكذلك القبول العام ولكن خلص إلى أن الإضافات فى جميع المستويات انتجت خبز مقبول حسيا.