Effectiveness of Some Fortified Nutritional Products with Sun Dried Banana Peels on Moody Status of Faculty Education Students in Nujran

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Abstract

Background: Banana Peels are important in protection from chronic diseases as blood pressure, anemia and depression; it contains vitamins C, E, B6, minerals and phenols which act as antioxidants.

Objective: This study was performed to know effectiveness of some fortified nutritional products with dried banana peels on moody status of faculty of education students.

Methods: Sample of 30 students are selected to perform difficult test, and they became anxiety, tension and depressed. The students ate fortified products with 20% banana peels (Cake, Biscuit, and Cookies). After half hour, a questionnaire of status mood evaluation is used to evaluate the mood status of the students.

Results: The results revealed that the mood status is improved, the sensory evaluation of fortified products is better than control samples. Chemical analysis of dried banana peels protein, fat, carbohydrate, crude fiber were 7.21 ± 0.34, 4.78 ± 0.91, 86. 7 ± 0.25, 43.38 ± 0.05, 1.31 ± 1.07, 6.67 ± 1.08, vitamins (A, B1, B6, C, E), were 9.074 ± 1.4, 0.65 ± 0.13, 1.85 ± 0.5, 1.38 ± 0.17, 129.78 ± 6.8, 0.26 ± 0.11, minerals potassium, calcium, sodium, iron, magnesium, phosphorus were 63.51 ± 0.17, 15.66 ± 0.38, 21.45 ± 0.24, 0.17 ± 0.11, 67.87 ± 0.41 and 41.08 ± 1.7 respectively. Total antioxidants and phenolic were 91.05 ± 1.69, 65.36 ± 0.25, 86. 7 ± 0.25, 43.38 ± 0.05, 1.31 ± 1.07, 6.67 ± 1.08, vitamins (A, B1, B6, C, E), were 9.074 ± 1.4, 0.65 ± 0.13, 1.85 ± 0.5, 1.38 ± 0.17, 129.78 ± 6.8, 0.26 ± 0.11, minerals potassium, calcium, sodium, iron, magnesium, phosphorus were 63.51 ± 0.17, 15.66 ± 0.38, 21.45 ± 0.24, 0.17 ± 0.11, 67.87 ± 0.41 and 41.08 ± 1.7 respectively. Finally, this study recommended using dried banana peels in bakery products to improve mood status. Because it is rich in minerals, antioxidants, phenolic and tryptophan which converted to serotonin, make anyone relax and happy.

Keywords: Bananas; Banana peels; Depression; Mood

Introduction

Mood status is playing important role in human life where the bad mood is classified as depression, which is a public health problem, it appears in the ages (20-50) years [1], may be because of genetics, biochemical, environmental and psychological factors [2,3]. Types of depression are mild, medium and severe depression [2]. Depression can be treated with antidepressants, but it has side effects as nervousness, blurred vision and suicidal thoughts [4]. The characteristics of depression are bad mood, loss of interest and appetite. Some people used herbal therapy or fruits especially bananas or banana peels as antidepressant [5]. Also, vegetables are considered one of the important parts against depression because of the contents of antioxidants and antimicrobial represented in vitamin C, E and ß-carotene. Some fruits have medical properties like banana fruit (BF). It is the important popular fruits in the world because it grows in tropical regions in over 122 countries and African countries, and considered a good source of minerals (P, Ca, Mg, Mn, and Fe) and antioxidant as galactoarabinan and dopamine, bananas have functional properties against cancer and heart disease because it contains vitamin C, E and ß-carotene [6-11]. Also, it treats blood pressure because it contains potassium [12,13]. Hussain and William [8] extracted antioxidants from bananas and BP, and showed that the antioxidants in the peels more than the pulp. Rodriguez Ambriz et al. [14] mentioned that banana flour is high level of indigestible polysaccharides, dietary fiber, vitamins, minerals and antioxidants. It could be used in some bakery products as bread to improve the nutritional quality and value to reduce the waste [15,16]. Perla Osorio Diaz et al. [17] used banana flour blends for spaghetti formulation. The waste extracted from the fruits is too large and caused environmental problems, so it can be disposed as subsidized [18]. For example, BP consists of 30% to 40% of total weight of the fresh fruit [19,20], also Ghorade et al. [21] and Fatemeh et al. [22] mentioned that BP represents 47% to 50%, it could be used in animal feed or fertilizer.

All parts of bananas plant including the peel have clinical properties for cardiovascular health, strokes, ulcers, wounds, burns, improvement blood pressure, the mood status, constipation, diarrhea, arthritis and anemia because it rich in iron [12,23-27]. In addition to the antibiotic, it acts against mycobacteria, antimicrobial activities, Antifungal and antibiotic principles [25-28]. Also, dietary fiber and pectins (50% on a dry matter) from (BF) and BP, proteins (7% dry weight), amino acids, polysaturated fatty acids and potassium can be extracted [29,30]. BP contains potassium, calcium, phosphorus, sodium, iron, manganese, bromine, rubium, strontium, zirconium, niobium and some organic compounds [19,31] also if BP exploited well, it will be a good source of carbohydrates and minerals [32]. It is possible to use BP in several industrial applications as bio-fuel production, bio-sorbents, pulp and paper, cosmetics, energy related activities, organic fertilizer, environmental cleanup, finally nutritional application like bread from wheat, defatted soy and banana flours [33,34].

Fresh and dried banana peels may be modifying acute liver failure because it contains vitamins and minerals that can act as antioxidant, in addition to phenols. Previous studies have approved the existence of vitamin C, E, B6 and B12 in banana peels, especially vitamin C that acts as antioxidant [35,36]. The ripe banana pulp and peel contain

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phytochemicals (anthocyanin, delphinine, cyaniding; Seymour, and catecholamines) [37]. Ehiowemwenguan et al. [38] they showed that BP is rich in carbohydrate and phytochemicals. Phenolics in BP ranged 0.90 to 3.0 gram/100 g DW [39], study of Kondo et al. [40] and Sulaiman et al. [41] demonstrated that BP includes higher phenolic compounds more than banana pulps. According to Someya et al. [9] explained that total phenolic in the peel 907 mg/100 g DW than in pulp 232 mg/100 g DW it is inhibits gastric secretion and stimulates the smooth muscle of the intestines and make relax and happy, also Velumani [42] studied Phytochemical and antioxidant in BP, he mentioned that if peels exploit will be a good source of antioxidant, phytochemicals and phenolic, also some studies recommended using BF or BP to improve mood and antidepressant [5], because BP is contain tryptophan which converted into serotonin, it is inhibits gastric secretion and stimulates the smooth muscle of the intestines and make relax and happy, So BP can be used as clinical nutrition [27,43-45]. Tavakkoli Kakhki et al. [46] and Kumar et al. [47] recommended that bananas are useful in curing for the depressed patients. Biscuits and cakes are considered of the popular bakery consumed all over the world [48], so this study aimed to study effectiveness of some fortified food products with dried bananas peels on moody status and depression.

Materials and Methods

Materials

Source of samples

- a. Banana peels used in the study were obtained from bananas fruit, purchased from local market, Cairo, Egypt, El Fayoum, February 2017.
- b. Wheat flour extraction (70% to 72%) was obtained from local market, Cairo, Egypt, El Fayoum.
- c. White sugar, salt, butter, eggs, bananas were obtained from local markets, Cairo, Egypt, El Fayoum.
- d. Thirty students from faculty of education, Nujran University, are selected to evaluate the supplemented products and measure the mood status.
- e. Sensory evaluation form, included (Taste, crust color and pulp color, flavor, pores, texture and overall acceptability).

Preparation of raw materials

**Banana peels powder:** The peels were obtained from banana fruit, washed well, peels were removed and washed well by water, the peels were dried by air for two weeks, grind to soft powder, sieved with a mesh of size 0.50 mm and the particle size of less than 1.0 mm [49]. Powder peels stored in plastic bags at freezer until needed for using.

Preparation of supplemented products with banana peels

i. Three types of food products (Cake, Biscuit and cookies) were supplemented with dried banana peels (DBP) at level (20%).

ii. Formulas consisted of 80 and 100 gm of flour, 25 gm sugar, one egg and 25 gm butter, half cup milk, as mentioned in Table 1.

iii. Replaced 20% wheat flour (WF) with 20% DBP (Dried Banana Peels).

iv. Flour and other ingredients were mixed and the dough at room temperature for 15 min, it was leaved 10 minutes, formed, and baked at 200°C for 10 minutes in an electric oven (Figures 1-3).

Sensory evaluation of supplemented (Cake, biscuit and cookies): Table 1:

<table>
<thead>
<tr>
<th>Samples</th>
<th>Cake</th>
<th>Biscuit</th>
<th>Cookies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Matters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formula 1 (0)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Formula 2 (20%)</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>WF (g)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>BP (g)</td>
<td>0</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Butter (g)</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Sugar (g)</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Salt (g)</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Milk (ml)</td>
<td>50</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Eggs</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Vanilla (g)</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Baking powder</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>*Formula 1: WF 100% (B0) control; Formula 2: BP 20% (B1)</td>
<td></td>
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</tr>
</tbody>
</table>

Thirty students were selected to evaluate (Taste, crust color, and pulp color, flavor, pores, texture and overall acceptability) of supplemented samples of (Cake, biscuit and cookies) compared to control. The samples obtained degree (4:5) were acceptable.

Samples of students: Thirty Students were selected to perform difficult test, they got low scores and, a questionnaire of mood status evaluation was used to evaluate the mood status of them, they became, anxiety, tension, lack of concentration and depressed. They ate fortified products with (20%) DBP (Cake, Biscuit, and Cookies). After half an hour, a questionnaire of mood status evaluation was used to evaluate the mood status of them and evaluation supplemented products with (20%) DBP (Cake, Biscuit, and Cookies). The samples obtained degree (4:5) were acceptable.

Analysis

**Chemical analysis of banana peels:** Protein content, fat, crude ash, crude fiber content were determined according to AOAC [50] and total carbohydrates were calculated by difference

- Total carbohydrates = 100 - (g protein + g fat + g ash)
**Determination of vitamins:** The content of vitamins (A, B1, B2, B6, E and C) were determined by methods described by Juarez-Garcia et al. [15]. These analyzes were determined by Food Technology Research Institute, Cairo University.

**Determination of minerals:** Minerals content (K, Ca, Na, Mg, Fe and p) were determined according to the methods of the AOAC [51] by FTRI, Cairo University.

**Determination of antioxidants and phenolic compounds:** The content of antioxidants and phenolic were determined according to Silva et al. [52]. These analyzes were determined by FTRI, Cairo University.

**Statistical analysis**

Statistical analysis of results was statistically analyzed using computer program [53]. One-way analysis of variance (ANOVA), low significant differences (LSD) and the difference was considered significant at p value <0.05 according to Zar [54].

**Results and Discussion**

Sensory properties, included taste, color of pulp, color of crust, flavor, texture and overall acceptability of supplemented samples (Cake, Biscuit and cookies) with 20% BP by replacing 20% WF (70% to 72% extraction) presented in Table 2. The replacement of 20% BP hadn't different significant, but it improved sensory properties, the results of mean values were (5.9, 4.7, 4.7) respectively compared to control (4.8, 4.8, 5.9). These results go parallel with Dooshima et al. [34] whose studied quality evaluation of composite bread produced from wheat, defatted soy and banana flours, it showed that bread from the composite flours of 20% substitution for both defatted soy and banana flours were accepted. According to the study of Eshak NS [55] about sensory evaluation and nutritional value of balady flat bread supplemented with banana peels as a natural source of dietary, she showed that replacing bread at 10% BP was accepted as sensory evaluation and nutritional value.

Banana peels contain various and important nutrients as minerals (potassium, calcium, sodium, iron and magnesium), vitamins (A, B1, B2, B6, E and C), tryptophan and rare compounds (antioxidants and phenolics). Data presented in Table 2 showed the proximate composition of BP compared to BF and WF (70-72% extraction). It cleared low in the protein content in BF and BP (1.07 ± 0.18 and 7.21 ± 0.34) respectively compared to WF (11.3 ± 0.2). Fats content in BP was high (4.78 ± 0.91) more than BF and WF (0.35 ± 0.3 and 2.16 ± 0.3). Fats have a vital role and biological functions in cells, it is used as energy source. The carbohydrates content of WF was low (85.84 ± 0.4) compared to BF and WF (93.65 ± 0.8 and 9.074 ± 1.4) but it was observed increasing in the content of vitamin (A and C) in BF (93.65 ± 0.8 and 0.317 ± 0.1) than BP. Vitamins C, E, and B6. Vitamin C acts as antioxidant and serotonin acts as antidepressant.

Data presented in Table 5 explained minerals content in BP. The amount of calcium, sodium, magnesium, and phosphorus in BP were high (15.66 ± 0.38, 21.45 ± 0.24, 67.87 ± 0.41 and 123.2 ± 0.53) respectively compared to BF (5.23 ± 0.74, 1.03 ± 0.01, 26.51 ± 2.8 and 43.38 ± 0.05), conversely potassium content and iron in BP were low (5.23 ± 0.74, 1.03 ± 0.01, 26.51 ± 2.8 and 43.38 ± 0.05) respectively. These results agreed with the results of Zenab and Ayman [35]. They reported that minerals content (K, Ca, Na, Fe,
Mg and P) in BP were (62.81 ± 0.14, 16.75 ± 0.14, 22.34 ± 0.34, 0.15 ± 0.12, 65.14 ± 0.37 and 41.08 ± 1.7) respectively. According to study of Eshak [55] about minerals content in BP, she reported that it is high in potassium, calcium, sodium, iron and manganese compared with WF. Also, Anhwange et al. [20] studied the chemical composition of BP of minerals (Ca, Na, P, Mg, K, and Fe). Study of Adlin [57] about the content of minerals in BP, he reported that BP consist of 55.59% Calcium, 0.36% Phosphor and gross energy (3727 kcal/kg).

Table 6 illustrated chemical analysis of total antioxidant and total phenolic compounds in BP compared to banana fruit.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>BF mg/100 g</th>
<th>BP mg/100 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total antioxidants</td>
<td>43.96 ± 0.3</td>
<td>65.36 ± 1.53</td>
</tr>
<tr>
<td>Total phenolic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Test results of antioxidants of antioxidant activity by DPPH radical %</td>
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</tr>
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</table>

Table 6: Chemical analysis of total antioxidants and total phenolic compounds in BP compared with banana fruit.

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