Apricot addition for Enrichment Yogurt with Amygdalin

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Abstract:

The objective of the present research was to enrich yogurt with amygdalin (vitamin B17) and increase the nutritional value of yogurt using apricot and a by-product of apricot fruit kernels. Amygdalin was considered an antibacterial, hepatic protecting, anti-tumor, antifungal, anti-inflammatory, anti-coagulant, anticancer, antiaging, antidiabetic, anti-atherosclerotic, anti-angina, and antioxidant. Apricots that were mixed in a blender for 3 min and filtered were used as a source of dietary fiber, lipids, proteins, minerals, and vitamins. Apricot kernels that were heated for 2 minutes at 120 °C. then cold and grind in a blender were used as a source of amygdalin (B17). Obtained results showed that the incorporation of apricot and apricot kernel is considerably impacted by the addition of apricot and apricot kernel 5% Apricot pulp + 1% Apricot kernel and 10% Apricot pulp + 2% Apricot kernel 1.42, 2.92 mg/100gm respectively.

Keywords: Yogurt, Apricot, Apricot kernel, Amygdalin, nutritive value.
اضافة المشمش لتدعيم الزبادي بالاميغداليين

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الخلاصة:
تهدف الدراسة الحالية إلى تدعيم الزبادي بالاميغداليين (فيتامين ب17) و زيادة القيمة الغذائية للزيادة عن طريق اضافة المشمش و نواة المشمش كمنتج ثانوى. يعتبر الاميغدالين مضاد للبكتريا و حماية الكبد و منضاد للأورام و الفطريات و الالتهابات و السرطان و الذبحة الصدرية و التخثر و الشيخوخة. تم شحنة المشمش في الخلاط لمدة 3 دقائق و تصفيته حيث يستخدم كمصدر للالياف الغذائية و الدهون و البروتين و الفيتامينات و الاملاح المعدنية. تم تسخين نواة المشمش لمدة 120 دقيقة و ترشيحها ثم تركها ليبرد و تخلط في الخلاط. أظهرت النتائج أن محتوى الأميغدالين في الزبادي الطازج المعد من 5%+1% نواة المشمش كان 1.4/100 ملجم و المعد من 10%+2% نواة المشمش 2.9/1000 جرام على التوالي.

الكلمات المفتاحية: الزبادي، المشمش، نواة المشمش، الأميغداليين، القيمة الغذائية.

1. Introduction:

Each person's eating habits determine how they should be fed, although all humans eat to maintain their health by consuming the nutrients found in food, particularly in fruits and vegetables [1, 2]. One of the most well-known fruits is apricot, which holds significant value due to its composition, which allows it to have a significant role in human nutrition and be utilized in a variety of non-food products. In terms of proteins (8%), sugars (more than 60%), crude fat (2%), crude fibers (11.50%), total minerals (4%), vitamins (vitamins A, C, K, and B), and reasonable levels of organic acids (malic and citric acids) [3]. Apricots are a fruit with a high nutritional richness [4, 5]. The apricot kernel contains exceptional nutritional value, much like the fruit. Particularly high in fat, protein, and dietary fiber overall, apricot kernels may be beneficial for human nutrition. Numerous research organizations have extensively examined the chemical and nutritional properties of apricot kernels [6].

Rosaceae nuclei are the source of the naturally occurring chemical amygdalin (D-mandelonitrile-b-D-glucoside-6 b-glucoside) [7]. It’s a cyanogenic glycoside present in several
fruits, including apricots. Amygdalin views it as a natural cancer treatment [8], antibacterial, hepatic protecting, anti-tumor, antifungal, anti-inflammatory, anti-coagulant, anticancer, antiaging, antidiabetic, anti-atherosclerotic, anti-angina, and antioxidant are only a few of the pharmacological properties of apricot kernels that have been documented [9, 12]. Additionally, apricot kernels have a significant role in both the management and prevention of chronic illnesses [5, 13].

These advantageous health effects are brought about by the presence of bioactive ingredients such as cyanogenic glycosides, Carotenoids, fatty acids, volatile substances, and polyphenols [5-14]. Algeria is one of the world’s top producers of apricots [15]. The majority of the country’s apricot crop is used for fresh or dried fruit, as well as for making jam and juice. Apricot kernels have long been regarded as trash in all these applications. Because agricultural wastes are readily available, biodegradable, and most importantly, less expensive, there has been an increased focus on their utilization in recent times [16, 17]. Because of this, researchers have invested in the value-adding of apricot fruits by recovering and using their seeds [18, 19]. Nevertheless, because apricot kernels contain amygdalin (cyanogenic glycoside, commonly referred to as laetrile or vitamin B17), which is hazardous when ingested in quantities higher than recommended, their usage in food is restricted. Despite this, considering their advantageous health effects, researchers have suggested that apricot kernels can be added to specific meal preparations [10-20].

This study focuses on increasing Amygdalin and the nutritional value of yogurt by using apricots and apricot kernels supplement, as they represent some of the waste resulting from the manufacture of juice, jam, etc. The Purpose for apricot juices is also to mask apricot kernel taste.

2. Materials:

The Ministry of Agriculture’s Animal Production Research Institute herd provided fresh cow’s milk. Apricots and sucrose sugar were acquired from a local marketplace. The laboratories of Chr. Hansen in Copenhagen, Denmark. CMC. provided a yogurt culture including Streptococcus thermophiles and Lactobacillus delbrueckii subsp. bulgaricus. Sigma-Aldrich was the source of amygdalin (98% purity), diethyl ether (98%), methanol, and HPLC-grade ethanol (98%).

3. Methods:

3.1 Preparation of apricot yogurt:

To make apricot pulp, mix in a blinder for three minutes, then filter. The apricot kernel was heated for 2 minutes at 120 °C., then let it cool after that grind it in a blinder. For 20 minutes,
fresh cow milk and 5% sugar were heated to 80°C. This milk was split into three identical portions. The 1st considered as control, 5 % Apricot juice + 1 % apricot kernel and 10 % Apricot juice + 2 % apricot kernel were added to the 2nd and the 3rd portions respectively. The three portions were inoculated with 3% yogurt culture. The chemical properties of the made apricot yogurt and its control were evaluated both during its fresh state and after a week of refrigeration at 6± 1°C.

3.2 Chemical analysis:

Total protein, fiber and Total lipids, Cyanide content and acidity were determined [21]. Total flavonoids were determined [22]. Total phenolics were determined [23]. Mg, K, and Ca: An innovative microwave digestion system was used to determine the values of Mg, K, and Ca. Thermo Scientific's Icap6000 series inductively coupled plasma (ICP-AES) is used to determine calcium, magnesium, and potassium. Argon gas excites an elemental atom. For every element, the sample values assumed the blank values. potassium calculated using the formula [24]. Amygdalin calibration curve: A stock 1, solution of 100 µg ml -1 was created by dissolving the amygdalin standard in water, and it was kept at 20 C until analysis. Six standard solutions containing 1, 5, 10, 20, 40, and 50 µg ml -1 of amygdalin were used to create a calibration curve [25]. Amygdalin extraction: Five grams of apricot kernels were blended, and two grams were weighed into a 200-milliliter conical flask. After adding 50 ml of water, the flask was put in a water bath with shaking at 37 °C. The extraction of amygdalin used 40,80,100,120, and 180 minutes. After filtering via Whatman No. 1 filter paper, the extracts were put into 50 ml plastic polypropylene tubes. Three times fat extractions were made by vortexing (20 ml) of n-hexane for one minute. The tubes were spun for 10 minutes at 3250 g using a benchtop Eppendorf 5810R centrifuge. Supernatants were combined and thrown away. The remaining hexane was removed from the sample using a rotary evaporator operating at low pressure, 35 degrees Celsius, and 7 millibars [25].

Sensory evaluation: All samples were evaluated as the organoleptic properties included flavor (20 points); body & texture (10 points) and Color and appearance (10 points) [7].

4. Statistical analysis:

Differences between samples were tested using a one-way analysis of variance using the COSTAT program and Standard deviation (SD) was calculated by Excel program.

4.1 The functional properties and chemical composition of apricot and apricot kernel:

Table 1 illustrates the chemical composition of apricot pulp and kernel while the Total protein was 6.4, 14.04 g/100 gm. These results are in accordance with the findings of [26]. Chemical composition results are in accordance with the findings of [5]. Amygdalin is not
detected in Apricot pulp. Apricot pulp contains $0.001 \pm 0.10$ HCN mg/gm on the other wise Apricot kernel contains $0.005 \pm 0.001$ gm/100 gm. Given that the lethal dose of HCN for an adult is $0.54$ mg/kg of body weight, this is safe [27].

**Table 1. Chemical composition of Apricot pulp and Apricot kernel**

<table>
<thead>
<tr>
<th></th>
<th>Apricot pul (g/100gm)</th>
<th>Apricot kernel (g/100gm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total phenols</td>
<td>0.072 ± 0.001</td>
<td>0.18 ± 0.001</td>
</tr>
<tr>
<td>Total flavonoids</td>
<td>0.012 ± 0.001</td>
<td>0.05 ± 0.000</td>
</tr>
<tr>
<td>Total protein</td>
<td>06.41 ± 0.02</td>
<td>14.04 ± 0.02</td>
</tr>
<tr>
<td>Total lipid</td>
<td>01.40 ± 0.01</td>
<td>08.34 ± 0.01</td>
</tr>
<tr>
<td>Total fiber</td>
<td>14.04 ± 0.02</td>
<td>30.54 ± 0.01</td>
</tr>
<tr>
<td>Ca</td>
<td>0.17 ± 0.001</td>
<td>0.20 ± 0.001</td>
</tr>
<tr>
<td>K</td>
<td>2.94 ± 0.001</td>
<td>0.65 ± 0.001</td>
</tr>
<tr>
<td>Fe</td>
<td>0.0031 ± 0.002</td>
<td>0.0004 ± 0.000</td>
</tr>
<tr>
<td>Amygdalin</td>
<td>Not Detected</td>
<td>0.16 ± 0.01</td>
</tr>
<tr>
<td>HCN</td>
<td>0.001 ± 0.001</td>
<td>0.005 ± 0.001</td>
</tr>
</tbody>
</table>

### 4.2 Chemical composition of apricot yogurt:

The chemical composition of the control and yogurt supplemented with different treatments of Apricot and apricot kernel is presented in Table 2 for fresh and stored yogurt. The data show that Amygdalin that is not detected in control and treatment 10% Apricot pulp + 2% Apricot kernel yogurt had a higher total protein, Total lipid, and Amygdalin contents being 4.32, 4.73, and 2.92 respectively.

The mean average of total protein, total lipid, and amygdalin contents of 5% Apricot pulp + 1% Apricot kernel yogurt and 10% Apricot pulp + 2% Apricot kernel yogurt samples increased with the advancing storage period at 6 ± 1 °C for 7 days which may be due to the evaporation of water and loss of moisture during the storage period.

**Table 2. Chemical composition of apricot yogurt**

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Control</th>
<th>5% Apricot pulp + 1% Apricot kernel yogurt</th>
<th>10% Apricot pulp + 2% Apricot kernel yogurt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fresh Yogurt</td>
<td>Fresh Yogurt</td>
<td>Stored yogurt (After 7 days)</td>
</tr>
<tr>
<td>Total protein</td>
<td>3.41 ± 0.01c**</td>
<td>3.86 ± 0.01b**</td>
<td>4.32 ± 0.01a*</td>
</tr>
<tr>
<td>Total lipid</td>
<td>3.9 ± 0.01c*</td>
<td>4.36 ± 0.01b*</td>
<td>4.73 ± 0.01a*</td>
</tr>
<tr>
<td>Amygdalin</td>
<td>Not Detected</td>
<td>1.42 ± 0.01b*</td>
<td>2.92 ± 0.01a*</td>
</tr>
</tbody>
</table>

Each value represents the mean ± S.E (Standard Error) and mean of three replicates. Values in the same column with the same letter are not significant at p≤0.05.
4.3 The acidity of apricot yogurt:

Table 3 indicated that significant increase in acidity with added 5 and 10% apricot pulp and 1 + 2% apricot kernel in fresh. The acidity percentage of 5% Apricot pulp + 1% Apricot kernel yogurt and 10% Apricot pulp + 2% Apricot kernel yogurt samples increased with the advancing storage period at 6 ± 1 °C for 7 days which may be due to the Production of lactic acid by yogurt culture during the storage period for 7 days at 6 ± 1 °C.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Control</th>
<th>5% Apricot pulp + 1% Apricot kernel yogurt</th>
<th>10% Apricot pulp + 2% Apricot kernel yogurt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh yogurt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acidity %</td>
<td>0.6 ± 0.1a**</td>
<td>0.8 ± 0.1b**</td>
<td>0.9 ± 0.1a**</td>
</tr>
<tr>
<td>Stored yogurt (After 7 days)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acidity %</td>
<td>0.7 ± 0.1a*</td>
<td>0.9 ± 0.1b*</td>
<td>1.0 ± 0.1a*</td>
</tr>
</tbody>
</table>

Each value represents the mean ± S.E (Standard Error) and mean of three replicates. Values in the same column with the same letter are not significant at p≤0.05.

4.4 Sensory evaluation of apricot yogurt:

Scores of sensory properties of yogurt are given in Table 4. Sensory properties were evaluated in fresh and after 7 days of storage period. Higher values were given by the panelists for the flavor, texture, and appearance of fresh control yogurt than stored yogurt. At fresh yogurt, 5% Apricot pulp + 1% Apricot kernel recorded the highest total scores (37 and 37) followed by treatment 10% Apricot pulp + 2% Apricot kernel. The same trend was also recorded after the storage period (7 days). Fresh control yogurt and fresh 5% Apricot pulp + 1% Apricot kernel are the best values than other treatments after storage.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Flavor (20)</th>
<th>Body and texture (10)</th>
<th>Color and appearance (10)</th>
<th>Total scores (40)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh yogurt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>19 ± 1</td>
<td>8 ± 1</td>
<td>9 ± 1</td>
<td>37</td>
</tr>
<tr>
<td>5% Apricot pulp + 1% Apricot kernel</td>
<td>19 ± 1</td>
<td>9 ± 1</td>
<td>9 ± 1</td>
<td>37</td>
</tr>
<tr>
<td>10% Apricot pulp + 2% Apricot kernel</td>
<td>17 ± 1</td>
<td>8 ± 1</td>
<td>8 ± 1</td>
<td>33</td>
</tr>
<tr>
<td>Stored yogurt (After 7 days)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>19 ± 1</td>
<td>8 ± 1</td>
<td>9 ± 1</td>
<td>36</td>
</tr>
<tr>
<td>5% Apricot pulp + 1% Apricot kernel</td>
<td>17 ± 1</td>
<td>8 ± 1</td>
<td>8 ± 1</td>
<td>33</td>
</tr>
<tr>
<td>10% Apricot pulp + 2% Apricot kernel</td>
<td>16 ± 1</td>
<td>7 ± 1</td>
<td>7 ± 1</td>
<td>30</td>
</tr>
</tbody>
</table>
5. Conclusion

It could be concluded through this study, that it is possible to produce yogurt supplemented with apricot and apricot kernel rich in many important nutritional components such as vitamins such as amygdalin, minerals, protein, fat, and fibers.

6. References


Web Site: https://isnra.net/index.php/kjps   E. mail: kjps@uoalkitab.edu.iq


