ProEnvironmen Original Article
ProEnvironment 15/52 (2022) 482 - 486

Antioxidant Capacity from Pumpkin, Hemp, Sesame and Goji Seeds and Their Use to Obtain a Product

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Received 1 November 2022; received and revised form 3 November 2022; accepted 25 November 2022; Available online 30 December 2022

Abstract

Two types of bars based on sesame seeds and other types of addition were made. The two types of products have a similar composition in the seed base, and the auxiliary products used have the role of changing the taste according to the consumer's preferences. The raw and auxiliary materials used have been used because they have a high antioxidant capacity and other benefits for the consumer. The highest antioxidant capacity was in goji, followed by the seeds of sesame, hemp, and pumpkin.

Keywords: antioxidant capacity from pumpkin seeds, hemp, sesame, goji.

1. Introduction

Pumpkin seeds are used a lot in food due to their nutritional functions. In some studies, chemical composition and benefits are analyzed according to geographical origin and variety [10] and are presented as very good sources of protein [18]. It exhibits antifungal, antibacterial, antioxidant and medicinal effects. The nutritional intake on the body is due to the variety of components, such as magnesium, manganese, copper, proteins, zinc, potassium, phosphorus, as well as other minerals, but also a high content of palmitic, stearic, oleic and linoleic acid [16]. Girgih et al., (2011) shows that in vitro experiments have shown that peptides produced from enzymatic hydrolysis of hemp seed proteins have high antioxidant properties [5]. Antioxidant peptides obtained from different natural foods bring a safe intake for the body compared to certain synthetic compounds, since they are easily absorbed by the body and present a high antioxidant activity [7, 11, 12]. Sesame seeds by chemical composition have antioxidant, anti-inflammatory, anticancer effects [4].

Sesame seeds and oils obtained have essential nutritional compounds, such as essential fatty acids and vitamins [13]. Goji berries are important due to the fact that they have several classes of antioxidant compounds such as carotenoids and polyphenols and have different amounts depending on the variety [2]. The purpose of this work is to analyze the antioxidant capacity of different types of seeds (pumpkin seeds, sesame, hemp and goji) used to obtain bars with benefits in human consumption.

2. Material and Method

Determination of antioxidant capacity of the raw materials. Antioxidant capacity analysis based on the following reagents: Reagent 1 methanol; reagents 2 new reaction buffer; reagent 3 PS-2 stock solution (photosensitizer and detection reagent), 250μl/vial; reagent 4 Calibration standard for the quantification of lipid-soluble antioxidants. Lipid-soluble samples should be dissolved with reagent 1 and, if necessary, diluted within the calibration curve. Samples should be vortexed prior to PHOTCHEM measurement. Principle of the ACL measurement method Free radicals (superoxide anion radicals) are produced by optical excitation (irradiation) of a photosensitizing substance (dye). These radicals are partially removed from the sample by reaction with the antioxidants present in the sample. In the measuring cells, the remaining radicals cause the detector substance to glow and therefore determine the antioxidant capacity of the sample.

The antioxidant capacity of the sample is quantified by comparison with the standard (construction of a calibration curve with TROLOX) and is given in standard equivalent units.

FT-IR spectroscopy experimental. The seed samples were crushed using a commercial blender obtaining a powder that was used on the same day. The sample was prepared using calcined potassium bromide as a matrix material and was mixed at a proportion of 3 mg of the sample (sesame seed powder and hempseeds) to 200 mg KBr. Then the mixture was condensed into 15 mm [3]. Measurements were carried out on the infrared scale of 350-4000 cm^{-1} and a spectral resolution was set at 4 cm^{-1} using a Jasco FT-IR-4100 spectrophotometer (Oklahoma City, OK United States) using KBr pellet technique. All spectra were acquired over 256 scans. The spectral data were analysed using Origin 6.0 software. Measurements were carried out on infrared scale of 500-4000 cm^{-1}.

Materials used to make the bars. Materials used to make bars. Bars based on sesame seeds. Two types of bars with a similar composition in seeds and with different additions were obtained. The first bar made contains: seeds of white sesame and black sesame; hemp seed; pumpkin seeds; goji berries; candied apricots and honey. The second type of made bar contains: seeds of white sesame and black sesame; hemp seed; pumpkin seeds; goji berries; candied sour cherries and agave syrup. Although the composition of the two types of bars made is slightly different, the seed base is common. These types of raw and auxiliary materials were chosen due to the multiple beneficial effects on the human body. Although the appearance of the two types of bars is very similar, the taste is totally different, the one with honey being much sweeter, unlike the one with agave syrup. Following the thermal process to which the two types of bars were subjected, they are to be put cold at a temperature of 3-5 °C for 2-3 hours. After the products have cooled, they can be cut into pieces and bars of 50 grams each are formed. Subsequently, these products were tasted by a number of 50 people.

3. Results and Discussions

Antioxidant capacity. Knowing the antioxidant activity in sesame seeds is important both for seed producers and for those who use these seeds in order to obtain different functional foods. Figure 1 shows the antioxidant capacity of the analyzed samples. Observe the highest values in goji.

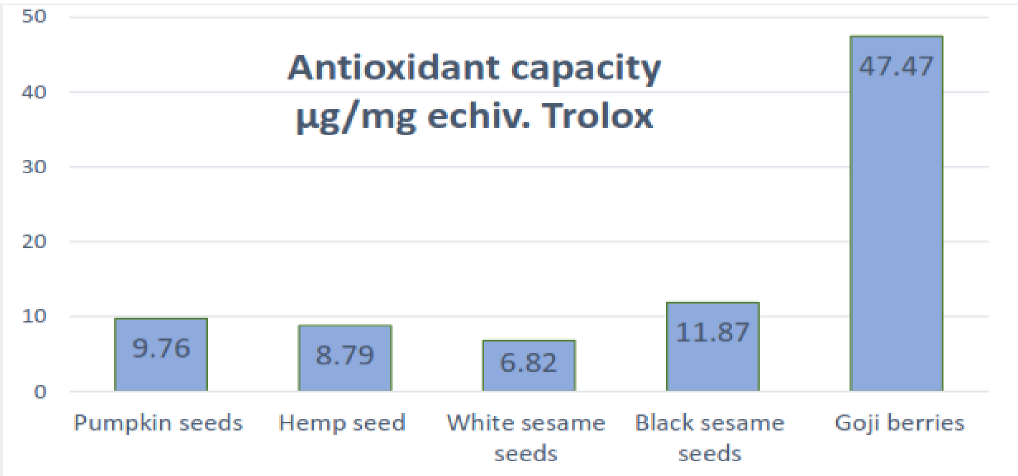

Figure 1. Antioxidant capacity

Currently antioxidants have an important role in different areas such as food and health and assess their effect on the health of the consumer. Pumpkin seeds, by virtue of their antioxidant capacity, play an important role for various diseases such as: diabetes, cardiovascular and heart diseases [19]. Pumpkin seeds have a high content of vitamin E, and pumpkin seed oil is a significant intake of vitamin E in the diet [8]. Other studies evaluating the antioxidant capacity of hemp seeds are reported by [7, 11].

Antioxidant peptides obtained from various natural foods bring a safe intake for the body compared to certain synthetic compounds, due to the fact that they are easily absorbed by the body and show high antioxidant activity [12]. The antioxidant capacity of goji berries is highlighted by [2], depending on the geographical area, by subspecies and varieties.

FT-IR analysis. The FT-IR spectra were used to identify the functional groups of the macronutrients based on the IR absorption in typical spectral regions. Characteristic of sesame and hempseeds seeds are the bands obtained from proteins, lipids and carbohydrates and these are clearly highlighted in the spectra obtained by the FT-IR technique. In the case of the spectrum obtained from hemp, the band located at 3305 cm-1, which must be related to the prediction of the presence of C- H of secondary amin stretching. An increase in the intensity of the bands can be observed from 2925 cm-1 attributed to the antisymmetric vibrational stretching oh CH and from 2854 cm^{-1} attributed to the vibrational symmetrical stretching vibrational vibrations of CH. Fig. 1 shows the FT-IR spectrum of hempseeds and a interesting region is a characteristic of various types of seeds it is represented by bands in the range from 2800-3000 cm^{-1}.

In the case of the spectrum obtained from the hemp, the band located at 3305 cm^{-1}, to be linked to the prediction of the presence of C- H stretching of secondary amine. An increase in the intensity of the bands can be observed from 2925 cm^{-1} attributed to vibrational antisymmetric stretching oh CH and from 2854 cm^{-1} attributed to vibrational symmetric stretching vibrations of CH [15]. The spectra for hemp seeds showed the typical carbonyl band at 1746 cm^{-1} and those of hydrogen/carbon bond (alkene, alkane) stretch in region 2700-3010 cm^{-1}, which were obviously dominant in the hemp sample [14]. The spectra seeds presented a band typical the protein amide I due to C=O stretching vibration at 1656 cm^{-1} and this band is more evidenced in the spectrum obtained from hemp [1].

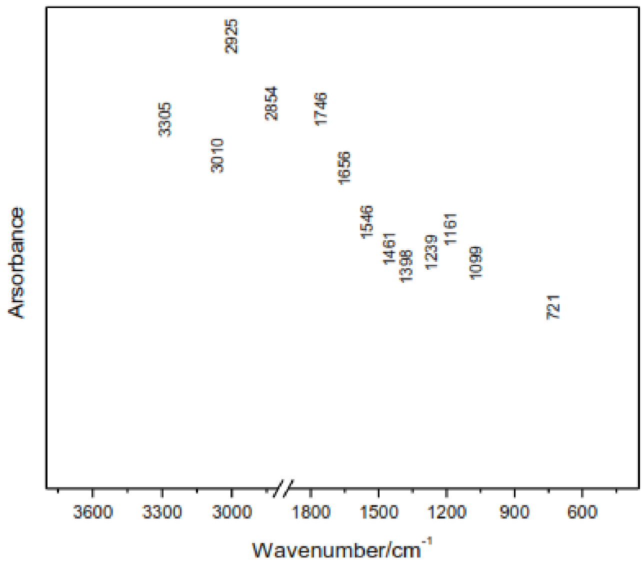

Figure 2. FT-IR spectrum of hempseeds

Carbohydrates possess characteristic IR absorptions between 1200 and 750 cm relevant to coupling and combination of stretching and deformation or vibrational modes of individual bonds in the molecular skeleton.

The scissoring of C-H showed, and band identified at 1461 cm^{-1}, stretching of C-O corresponding to 1239 cm^{-1} and 1161 cm^{-1} with medium intensity. The absorption bands for rocking of CH_2 may be found at 721 cm^{-1} [19].

Sour cherries. Agave syrup and honeySour cherries. These fruits were used because they are rich in phenolic compounds, cellulose, pectin and lignin, vitamin C and potassium) [6]. Sour cherries are rich in dietary fiber that have a positive impact on health, especially related to the gastrointestinal system. The total content of dietary fiber in sour cherries was determined as 71.44% of dry oil and the composition is as follows: lignin (69.4%), cellulose (18.4%), hemicellulose (10.7%) and pectin (1.5%) [17].

Agave syrup has been used in the product for its fructose and glucose content and the fact that it contains traces of sucrose and the importance it has on the body.

Honey has been used because it is a natural product that contains about 200 substances that consist not only of highly concentrated solutions of sugars, but also the complex mixture of other saccharides, amino acids, peptides, enzymes, proteins, organic acids, polyphenols, vitamins and minerals.

Sesame-based bars. The raw and auxiliary materials used in the process of obtaining sesame-based bars contain multiple beneficial effects, improving the taste and nutritional qualities of the finished product. The assessment of consumer preferences based on the questionnaires used to assess the finished product was carried out on the basis of the following questions:

a) How often do they consume functional foods? Respondents responded as follows: 40% consume functional foods 2-3 times a week; 20% consume 2-3 times a month; 20 % consume once a week; 10% consume daily and still 10% do not consume dietary supplements at all.
b) In what form do you consume functional foods? It is noted that from the range of the variant of functional foods on the market, 45% consume teas, 30% consume bars, 15% consume supplements in the form of capsules and only 10% do not consume at all.
c) How do you assess the taste of these products? 70% of respondents consider that the products are very good, 20% consider them only good, and 10% say that these bars are not to their taste.
d) To buy such a product? 90% would buy such products and only 10% consider that they are not to their liking, as a result they would not buy.
e) On a scale of 1 to 5 how satisfied are you with these products? It is noticed that the marks awarded to the products presented are very high, 70% giving them the maximum grade, 5, 20% the 4th grade and 10% the 3rd grade, not being the people to give them the grade 1 or 2.
f) Would you recommend to other people to consume such products? 90% responded that they would recommend the tasted products to other people and only 10% would not want to recommend them.
g) What price would you be willing to pay for these products? It is noticed that after tasting, 50% of people appreciate the products and would offer the price of 3-8 lei, 20% would pay only 1-3 lei, and the remaining 30% are willing to offer between 8 and 10 lei for these products.
h) Have you ever consumed similar products from a compositional point of view? 95% of respondents have consumed similar products before and only 5% have not consumed them.
i) Which of the two products (bar with agave and cherry syrup or the bar with honey and apricots) do you find better? 60% of respondents prefer the bar with agave syrup and sour cherries and 40% of respondents consider the honey and apricot bar to be better.

4. Conclusions

The questionnaire shows that most of the people involved are interested in buying these products and even recommending them to other consumers. An important aspect is that these products are beneficial to the human body through the raw and auxiliary materials that are used to obtain these bars. Through their antioxidant capacity and chemical composition, both raw materials and auxiliary materials bring superior nutritional value to these products.

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