

## Characterization of high protein raw truffles

Valentina Murgoi<sup>1</sup>, Georgiana – Felicia Bustan<sup>1</sup>, Mario Daniel Rusu<sup>1</sup>,  
Adrian Riviș<sup>1</sup>, Daniela Stoin<sup>1</sup>, Ariana-Bianca Velciov<sup>1\*</sup>

<sup>1</sup>Faculty of Food Engineering, Banat's University of Agricultural Sciences and Veterinary Medicine „King Michael I of Romania” from Timișoara, Romania

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### Abstract

The aim of this study was to prepare and analyze the physico-chemical and nutritional properties of some functional products with high nutritional value and rich in protein, namely raw protein truffles. These truffles contain only natural ingredients (dates, hemp seeds, chia seeds, cocoa butter, carob powder), thermally or chemically unprocessed. They are naturally sweet, because of dates, are rich in vitamins, minerals, antioxidants, fibers, proteins, essential fatty acids. They do not contain colours, preservatives, emulsifiers, stabilisers, thickeners, and sweeteners. All these qualities make truffles a superfood.

Analyzes were performed on each ingredient and implicit on the finished product in order to find out the nutritional value of a functional product made from super ingredients and to show how this product can improve the performance and quality of the consumer's life.

**Keywords:** high nutritional value, raw hyperprotein truffles, healthy diet, superfoods.

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### 1.Introduction

A raw food diet tends to be high in fruits, vegetables, nuts, and legumes, all of which are staples of a healthful diet. Eating a range of these foods will provide plenty of vitamins, minerals, and healthful fats, and protein.

Cooking destroys some nutrients, such as water-soluble vitamin B and vitamin C, so eating food raw ensures a better supply of these [1].

In this context, the importance of dates, hemp seeds, chia seeds, cocoa butter, carob powder derives from their complex chemical composition, implicitly from their food value, but also from the fact that in some countries they are considered superfoods.

Date is a delicious fruit with a sweet taste and a fleshy mouth feel. The major component of dates are carbohydrates (mainly the sugars; sucrose, glucose, and fructose), which may constitute about 70% of caloric value. The sugars in dates are easily digested and can immediately be transported into the blood after consumption and can quickly be metabolized to release energy for various cell activities.

Dates are also a good source of fiber, and contain many important vitamins and minerals, including significant amounts of calcium, iron, fluorine and selenium [2].

Carob powder is a valuable source of vitamins E, D, C, niacin, B<sub>6</sub>, and folic acid; vitamins A, B<sub>2</sub>, and B<sub>12</sub> are provided in lower levels. Specifically, the pulp is composed of sugars, polyphenols (e.g., tannins, flavonoids, phenolic acids), and minerals (e.g. K, Ca, Mg, Na, Cu, Fe, Mn, Zn), whereas the seed contains proteins, dietary fibers, polyphenols, minerals and is free of gluten [3,4].

Despite their tiny size, chia seeds are one of the most nutritious foods on the planet. The consumption of chia seeds (*Salvia hispanica* L.) has increased in recent years particularly due to its high content of  $\omega$ -3 fatty acids and dietary fiber. Chia seeds also contain high quality proteins which offer all the essential amino acids and several vital minerals. In addition, chia seeds are a potential source of antioxidants and polyphenolic compounds such as chlorogenic acid, caffeic acid, myricetin, quercetin, and kaempferol with the major phenolic acid being rosmarinic acid [5].

Cacao butter is incredibly rich in oleic acid, palmitic acid and stearic acid, which are vital antioxidants that not only increase healthy longevity but also lower stroke risk [6].

Cocoa has more phenolics and higher antioxidant capacity than green tea, black tea, or red wine [7].

Hempseed offers a unique nutritional package, in terms of dietary oil, protein, vitamins and minerals, which can be produced at high latitudes. The protein in hempseed is complete, in that it contains all of the essential amino acids in nutritionally significant amounts [8].

## 2. Material and Methods

### 2.1. Materials

Dates, hemp seeds, chia seeds, cocoa butter, carob powder analyzed in this study have been purchased from hypermarkets and specialized stores from Timisoara.

These protein raw truffles were obtained by mixing the dates, hemp seeds, chia seeds, cocoa butter and carob powder, thermally or chemically unprocessed.

The experimental analyzes were performed on the raw materials used to obtain the truffles and on the final product.

### 2.2. Methods

For moisture and dry matter content, samples weight was measured by using a digital balance with a sensitivity of 0.001 g. Gravimetric method was used to determine the moisture of samples, using a moisture analyzer Nabertherm model 6/11 with automated programming and electronic display. The level of moisture was tested for all samples by heating a known weight of sample in the hot air oven ( $100 \pm 5^\circ\text{C}$ ) until constant weight [9,10]. Moisture content can be determined from total solid content (TSC) as below:

$$\text{Moisture (\%)} = 100 - \text{TSC(\%)},$$

where total solid content (TSC) represent dry matter.

In order to determine the total mineral content (ash), dried samples were calcined in the Nabertherm LE4 oven (Germany), at  $505^\circ\text{C}$ . The temperature was gradually raised to  $505^\circ\text{C}$  (when the ash became gray-white and the mass of crucible with the burned sample remained constant) [10].

The method for determination of ascorbic acid content (vitamin C) was by titration with 2,6-dichlorophenolindophenol until a pink colour appeared [10].

The method for determination of acidity was by titration with NaOH 0,1 N in the presence of phenolphthalein [10].

$$\text{Acidity (\%)} = \frac{V * N}{W} * 100$$

where: V - NaOH used volume (mL); N - NaOH normality (0.1 N); W: sample weight (g) [10].

All determinations were performed in triplicate, calculating their arithmetic mean of three separate determinations. The statistically data were acquired using the program Microsoft Excel.

## 3. Results and discussions

The results obtained from the physico-chemical analysis of protein raw truffles and including the ingredients used are shown in fig. 1-4.

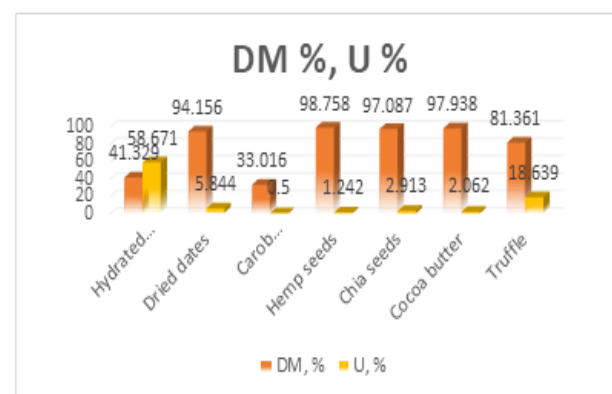


Figure 1. Determination of dry matter and moisture (U%) content using the oven

As seen in the figure above, the highest dry matter content is recorded for hemp seeds (98.75%). About 25% of the calories in hemp seeds come from protein. They also contain all the essential amino acids, making them a complete protein source [11]. The lowest value is for carob powder (33%). The highest percentage of humidity is observed in hydrated dates (58.6%), and the lowest percentage of humidity has carob powder (0.5%). The final product has a dry matter content of approx. 82% and a humidity of 18.6%.

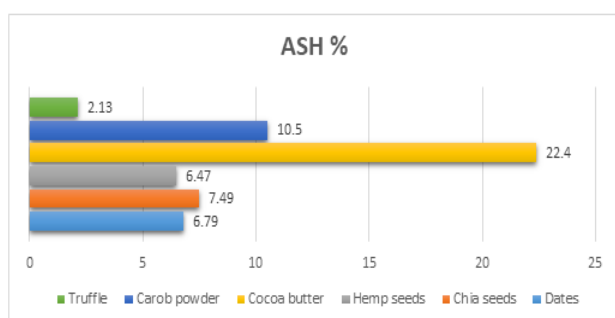


Figure 2. Determination of total mineral substances (ash)

From the data presented above, it appears that the highest content of ash is for cocoa butter (22.4%), and the lowest content is recorded for the finished product (2.13%).

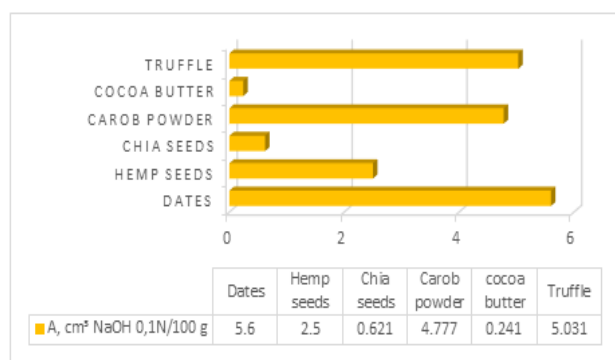


Figure 3. Determination of acidity

The graphic shows that the highest acidity corresponds to dates (5.6°), and the lowest acidity is recorded for cocoa butter (0.24°). The truffles have an acidity of 5°.

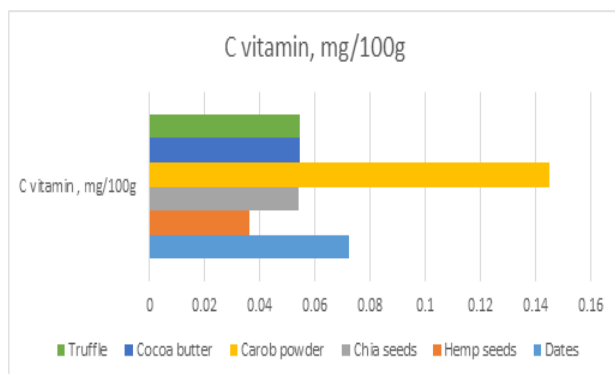


Figure 4. Titrimetric determination of vitamin C in vegetables

The figure above shows that the highest amount of vitamin C is found in carob powder (0.14 mg / 100g), and hemp seeds have the lowest value (0.036 mg / 100g). Truffles have a vitamin C content of 0.054 mg / 100g.

#### 4. Conclusion

Studies and analyzes performed on ingredients and implicitly on the final product have indicated numerous health benefits. Following the laboratory analyzes, it was found that the final product has a dry matter content of approx. 82% and a humidity of 18.6%. The determination of acidity showed that the truffles had an alkaline character.

Regarding the vitamin C content, the analyzes and calculations performed recorded a value of 0.054 mg / 100 g for truffles.

This study aimed to prepare and analyze a raw vegan food, namely hyperprotein truffles. They contain only natural, raw, thermally or chemically unprocessed ingredients. They are naturally sweet due to dates, they are rich in vitamins, minerals, antioxidants, fiber, complete proteins, essential fatty acids. They do not contain additives, emulsifiers, preservatives, artificial colors. All these qualities make truffles a superfood.

**Compliance with Ethics Requirements.** Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human or animal subjects (if exist) respect the specific regulation and standards.

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