EVALUATION OF THE NUTRITIONAL VALUES OF AMARANTH AND CHIA SEEDS

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Abstract: *Both types of seeds, of high nutritional value were well known as part of Aztec diet. There is evidence that Amaranth seeds were found in the caves of Tehuacan Puebla in Mexico, an early agricultural site, dating from around 4000 BC, while chia seed seems to have been used as food as early as 3500 BC, and was cultivated in the Central Valley of Mexico between 2000 and 2600 BC by the Teotihuacan and Toltecs, Amaranth is present also at the archeological sites in Southeast Asia and China, some of the seeds of Amaranth were found in Uttar Pradesh and are dated back to 1000 BC. Being banned by the conquistadores upon their conquest of the Aztec the plant has grown in USA as a weed since then and started to be studied and cultivated only in the 1970s and by the end of 1970s, a few thousand acres started to be cultivated, Opposite to that India is considering Amaranth the seed sent by God (ramdana). Despite their obscurity, both seeds can contribute for feeding the world's hungry and are recommended for their nutritional value and health benefits: decreasing plasma cholesterol levels (amaranth), protecting the heart (chia and amaranth), anti-cancer activity (chia and amaranth), improving conditions of hypertension (chia and amaranth), anti-allergic (amaranth) and anti-oxidant properties (chia and amaranth), reducing blood sugar (chia) and offering high quantities of calcium, phosphorus and manganese (chia).*

Key words*: ancient cultivars, Millennium food, anti-cancer, antioxidants*

INTRODUCTION

Identifying new food sources of nutrients to obtain foods with high nutritional value is a challenging field of research. This refers to obtaining flour from various sources (tubers, legumes, cereals, fruits, etc.) which, when mixed with other raw materials, increase the nutritional value and functional capacity of the new food product [5].

The seeds of amaranth (*Amaranthus caudatus*) and chia (*Salvia Hispanica*) have considerable protein content, do not contain gluten and are rich in minerals, vitamins and amino acids [2, 5]. The protein value of these pseudo cereals is much higher than that of rice, whole wheat flour or rye [3]

Chia seeds contain phenolic compounds (rosmarinic, protocatechuic, ferulic and caffeic acids), flavonols (quercetin, kaempferol, myricetin) [7], with remarkable properties in preventing various chronic degenerative diseases: hypertension, diabetes, cardiovascular disease, and certain types of cancer [10].

In addition to the high calcium, phosphorus, magnesium, potassium, iron, zinc and copper content, chia seeds have a protein and fiber content, three times higher compared to spinach, legumes and milk, a fact confirmed by recent studies that demonstrates the use of chia gel to replace eggs in cakes without altering sensory characteristics [9].

Amaranth seeds contain proteins with high digestibility and have essential amino acid content close to the optimal level required in the human diet [4]. In addition, they contain polyphenolic compounds with strong antioxidant character such as phenolic acids (ferulic acids, p-coumaric, vanillic, gallic acids) and flavonoids (rutin, vitexin and isovitexin) [8]. Amaranth berries are considered functional foods used successfully in the prevention and/or treatment of chronic degenerative diseases [1].

Amaranth can replace flour in some cereal products which significantly changes their technological and functional properties. In addition some studies have demonstrated successful use of amaranth flour as a thickener in sauces [6].

Therefore, amaranth and chia seeds are a generous alternative for effectively meeting the nutritional requirements of humankind, increasing the reserves of protein sources that can be included in current nutritional concepts [2, 5].

The paper performs a comparative analysis of the nutritional value of raw and processed amaranth and chia seeds.

MATERIALS AND METHODS

The evaluation of the seeds was based on the nutritional charts regarding raw and processed seeds presented by USDA database [11, 12, 13, 14, 15]. The used methods were area calculation of the variations between nutritional values of raw and thermal processed amaranth and chia seeds, cluster analysis and data fingerprint.

RESULTS AND DISCUSSION

From figure 1 we observe that by processing the chia seeds, Se, Na, Vitamin A, and total carbohydrates contents are increasing compared to raw seeds, while the rest of parameters decrease or remain relatively constant.

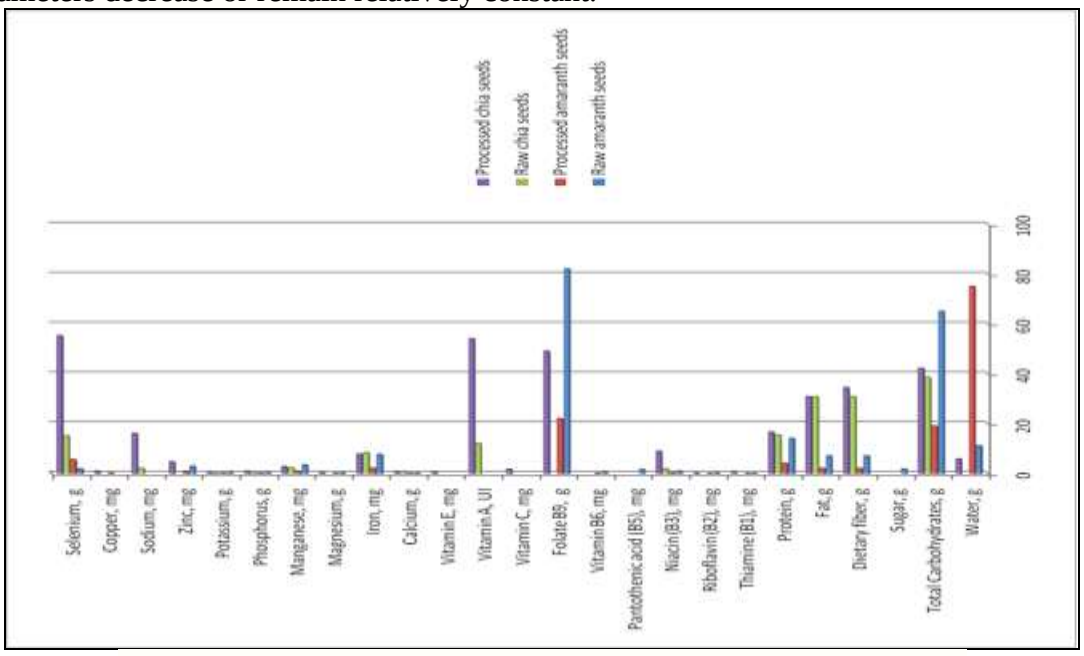

Figure 1. The influence of treatment on the properties of seeds

Amaranth seeds show different behave after thermal treatment, in the sense that Se, folate and total carbohydrates contents are decreasing. According to the Fingerprint chart the highest modifications, in the case of amaranth seeds, present the mineral content, for example Mg content is decreasing with 40% while Fe content is decreasing with 5%. The differences are less visible in chia seeds (Figure 2).

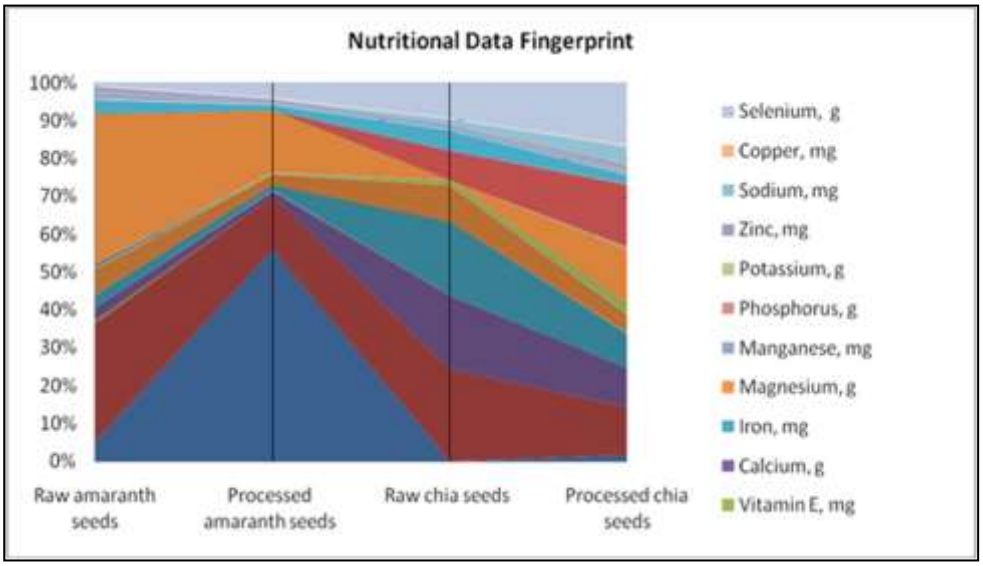

Figure 2. Data Fingerprint of raw versus processed seeds

If we apply the cluster analysis we observe that chia is not suffering to many modifications during thermal treatment, while processed amaranth seeds differ very much from raw seeds (almost 50%) (Figure 3).

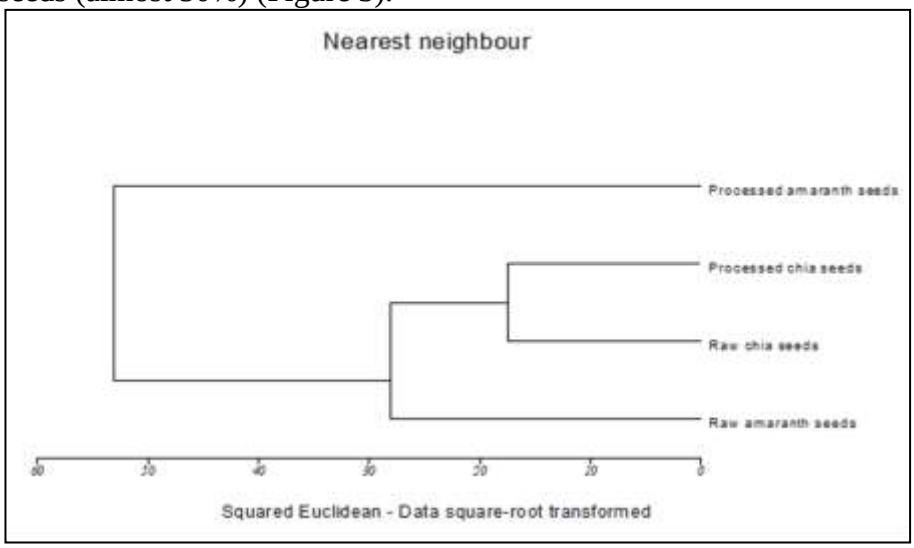

Figure 3. Cluster analysis of data

Amaranth seeds cannot be used raw because it contains components that block the absorption of some nutrients in our digestive system. Prior to cooking, it's ideal to soak the seeds in water to reduce the time of cooking to make the seeds more digestible, but also to loose less nutritional compounds during thermal treatment. Compared to amaranth chia seeds can be consumed raw or cooked, but they should be added to another food or soaked before eating (Figure 4).

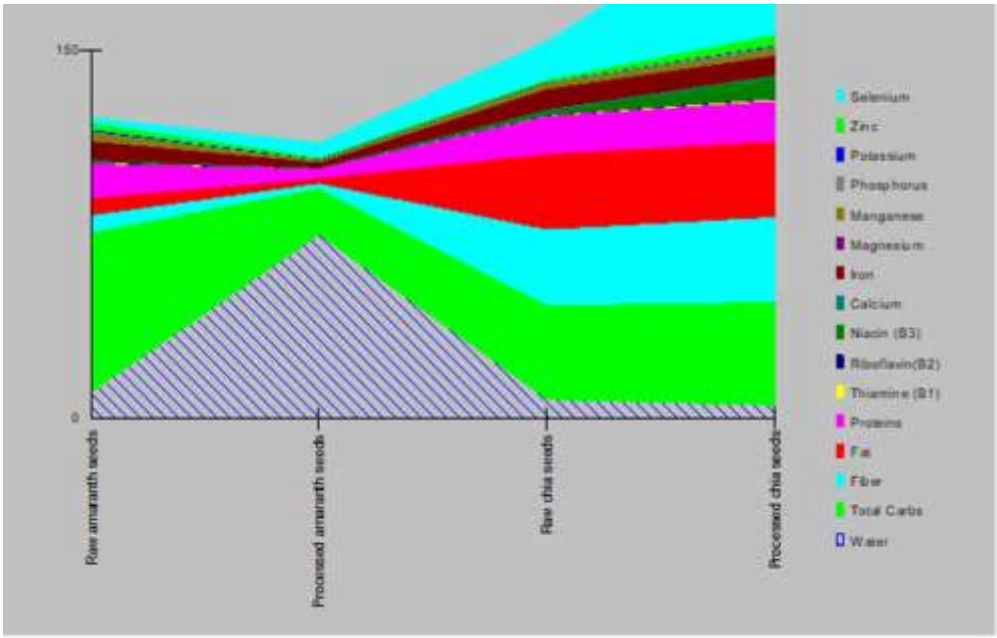

Figure 4. Raw versus Processed Seeds

Both seeds are recommended for lowering cholesterol, blood pressure and are very rich in antioxidants and minerals.

CONCLUSIONS

Thermal treatment is influencing more the nutritional value of amaranth seeds while chia seeds show fewer differences.

The observation present high value in special for nutritionists when they create personalized diets.

Also its important for the food producers when they create new food products to identify the best ways to process the food.

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